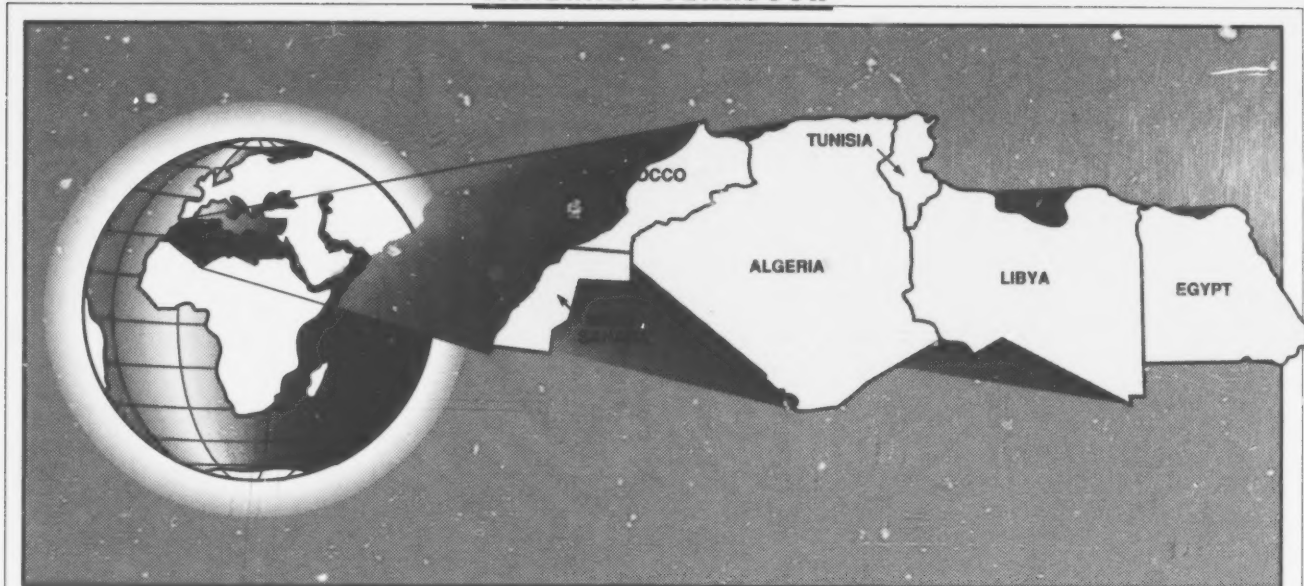


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MINERALS YEARBOOK



THE MINERAL INDUSTRIES OF
NORTH AFRICA

By Thomas P. Dolley and Bernadette Michalski

1988
INTERNATIONAL REVIEW

U.S. DEPARTMENT OF THE INTERIOR
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NORTH AFRICA



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THE MINERAL INDUSTRIES OF NORTH AFRICA

By Thomas P. Dolley and Bernadette Michalski

ALGERIA¹

Algeria's economic recovery program was based largely on reducing imports, curbing demand, and increasing economic efficiency. The program met with some measure of success as the nation shifted from a trade deficit of \$1.2 billion² in 1986, when petroleum prices were low, to a positive trade balance estimated at \$1.7 billion in 1988. The nation's external debt was estimated at \$21.5 billion. To help reduce the debt service ratio, the Government has launched an aggressive policy to develop and market hydrocarbons, particularly natural gas.

Reduced production from Algeria's depleting oilfields made investments in hydrocarbon exploration, production, and processing imperative. The 1986 Hydrocarbons Law was a step in attracting foreign investors and resulted in at least three exploration agreements through 1988. The agreements were between foreign companies and the Gov-

ernment's hydrocarbon agency, Société Nationale pour la Recherche, la Production, le Transport, la Transformation, et la Commercialisation des Hydrocarbures (SONATRACH).

The Government's investment spending budget was projected at \$7.8 billion. Included in the Government's priority list was the development of the Hamra Gasfield, construction of the Tebessa fertilizer plant, and the construction of the Bellara steel complex.

Production and Trade

Algeria led the members of the Organization of Petroleum Exporting Countries (OPEC) cartel in natural gas production and exports and ranked sixth among the world's producers. Although petroleum production remains significant, the nation's older wells required gas reinjection to maintain pressures. Algeria's dwindling oil reserves prompted the Government to focus on marketing natural gas, condensates, and refined products. Hydrocarbon export sales consisted of refined prod-

ucts, \$2.1 billion; condensates, \$1.9 billion; natural gas, \$1.8 billion; and crude oil, \$1.4 billion. All other exports earned only \$0.4 billion.

Revenues from natural gas exports are expected to increase appreciably as traditional and new export markets respond to Algeria's introduction of a realistic market-based pricing formula. By 1994, exports are expected to reach 1.4 billion cubic feet compared with 0.9 billion cubic feet in 1988.

Commodity Review

Metals.—Iron Ore.—The bulk of Algeria's iron ore output was extracted from the mine at Ouenza. Mining operations spread over 17 square kilometers with the main seam 2 kilometers long and 500 meters wide. Production totaled 2.8 million tons of hematite ranging from 53% to 60% iron content requiring removal of 5.6 million tons of overburden.

Iron ore was also mined at Boukadra and shipped with Ouenza ore by rail to

TABLE 1
ALGERIA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	1984	1985	1986	1987 ^a	1988 ^a
METALS					
Cadmium, refined ^a	80	128	124	125	125
Copper concentrate:					
Gross weight	820	—	—	—	—
Cu content	115	—	—	—	—
Iron and steel:					
Iron ore, gross weight	3,664	3,776	3,360	3,380	3,400
thousand tons					
Metal:					
Pig iron ^a	1,100	1,100	1,100	1,100	1,700
do.					
Steel, crude ^a	700	750	750	750	750
do.					
Lead, concentrate, Pb content ^a	4,000	3,800	3,600	3,600	3,500
Mercury	17,000	23,000	22,000	22,000	20,000
76-pound flasks					
Silver ^a	120	120	120	120	120
thousand troy ounces					
Zinc:					
Concentrate, Zn content	14,600	13,500	16,500	13,000	12,000
Metal, smelter output	35,000	35,700	29,000	19,000	18,000

See footnotes at end of table.

TABLE 1—Continued
ALGERIA: PRODUCTION OF MINERAL COMMODITIES¹
(Metric tons unless otherwise specified)

Commodity ²	1984	1985	1986	1987 ^P	1988 [*]
INDUSTRIAL MINERALS					
Barite, crude	15,200	60,000	60,300	60,000	60,000
Cement, hydraulic [®] thousand tons	5,500	³ 6,096	³ 6,460	6,500	6,500
Clays:					
Bentonite	31,000	32,000	30,000	30,000	30,000
Fuller's earth [®]	3,500	3,500	3,500	3,500	3,500
Kaolin	14,400	13,000	14,200	14,000	14,000
Diatomite	1,600	2,600	4,000	4,000	4,000
Gypsum ^{®4} thousand tons	250	250	275	275	275
Lime, hydraulic [®] do.	40	40	40	40	40
Nitrogen: N content of ammonia	146,300	150,000	150,000	150,000	150,000
Phosphate rock thousand tons	1,000	1,207	1,203	1,073	³ 1,332
Salt do.	175	168	190	200	200
Sodium compounds: Caustic soda [®]	700	700	700	700	700
Strontium minerals: Celestite, gross weight [®]	5,400	5,400	5,400	5,400	5,400
Sulfur, elemental [®]	20,000	20,000	20,000	20,000	20,000
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural:					
Gross billion cubic feet	3,223	3,543	3,440	3,350	3,500
Dry ⁵ do.	1,360	1,360	1,330	1,525	1,585
Natural gas plant liquids thousand 42-gallon barrels	30,000	33,100	40,550	45,750	35,000
Petroleum:					
Crude do.	233,508	234,095	248,675	239,200	236,800
Condensate from oil and gas fields do.	145,000	150,000	160,000	170,000	175,000
Refinery products:					
Gasoline thousand 42-gallon barrels	52,925	59,500	51,500	52,000	52,000
Kerosene and jet fuel do.	12,045	15,300	14,600	14,600	14,600
Distillate fuel oil do.	4,745	5,100	5,100	5,500	5,500
Residual fuel oil do.	730	700	700	700	700
Lubricants do.	52,560	42,700	48,500	49,000	49,000
Refinery fuel and losses do.	6,205	6,200	6,200	6,300	6,300
Other do.	35,040	34,700	40,500	40,500	40,500
Total do.	164,250	164,200	167,100	168,000	168,600

^{*} Estimated. ^P Preliminary. ¹ Revised.

¹ Table includes data available through June 29, 1986.

² In addition to the commodities listed, secondary aluminum, secondary lead, and secondary copper may be produced in small quantities and crude construction materials presumably are produced for local consumption, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

³ Reported figure.

⁴ Includes approximately 50,000 tons of plaster each year.

⁵ Excludes gas used in reinjection, flaring, venting, transmission losses, and natural gas liquids extraction.

TABLE 2
ALGERIA: EXPORTS OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	1986	1987	Destinations, 1987	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, scrap	203	177	—	France 142; West Germany 35.
Copper: Metal including alloys:				
Scrap	5,290	1,760	—	France 712; West Germany 518; Italy 451.
Semimanufactures	717	—		
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	—	60,591	—	Czechoslovakia 42,113; Albania 18,448.
Metal:				
Scrap	148,415	150,637	2,416	Spain 91,370; Italy 44,541.
Pig iron, cast iron, related materials	66,841	72,656	—	Italy 46,590; Denmark 11,247; Bulgaria 9,941.
Steel, primary forms	38,628	73,241	94	Italy 38,957; Thailand 11,636; United Kingdom 7,589.
Semimanufactures:				
Bars, rods, angles, shapes, sections	5,420	1,979	—	All to Italy.
Universals, plates, sheets	28,638	35,391	7,495	Italy 9,285; United Kingdom 6,005.
Tubes, pipes, fittings	12,216	14,649	7,755	United Arab Emirates 2,903; Belgium-Luxembourg 2,113.
Lead:				
Ore and concentrate	3,153	3,471	—	Sweden 2,512; France 959.
Metal including alloys, scrap	—	2,000	—	All to Italy.
Magnesium: Metal including alloys, scrap	—	2	—	All to France.
Mercury 76-pound flasks	16,535	17,637	—	East Germany 9,718; Romania 2,002; Netherlands 1,508.
Nickel: Metal including alloys, scrap	—	1	—	All to France.
Zinc: Metal including alloys:				
Scrap	923	656	—	All to Italy.
Unwrought	28,772	3,236	—	All to Hungary.
Other:				
Ashes and residues	720	942	—	All to France.
Base metals including alloys, all forms	225	224	—	All to Netherlands.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones value, thousands	\$4	\$1	—	All to Tunisia.
Barite and witherite	1,000	1,000	—	All to Albania.
Cement	—	150	—	All to Senegal.
Clays, crude	3,117	5,495	—	Tunisia 4,490; Iraq 1,000.
Diatomite and other infusorial earth	40	380	—	All to Tunisia.
Fertilizer materials: Manufactured:				
Ammonia	75,181	63,101	—	Greece 41,118; Spain 21,983.
Nitrogenous	4,066	83,366	—	France 80,023.
Graphite, natural	132	67	—	All to France.

See footnotes at end of table.

TABLE 2—Continued
ALGERIA: EXPORTS OF MINERAL COMMODITIES¹
(Metric tons unless otherwise specified)

Commodity	1986	1987	United States	Destinations, 1987	
					Other (principal)
INDUSTRIAL MINERALS—Continued					
Phosphates, crude	725,363	855,520	—	United Kingdom 117,597; Romania 101,633; Poland 91,239.	
Salt and brine	13,938	4,942	—	Benin 4,440; Niger 502.	
Stone, sand and gravel: Dimension stone, worked	24	6	—	All to France.	
Sulfur: Sulfuric acid	37,645	—			
Other: Crude	1,167	—			
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural: Gaseous and liquefied	billion cubic feet	728	880	—	Italy 365; France 330.
Coke and semicoke		34,184	36,219	—	All to Tunisia.
Petroleum:					
Crude	thousand 42-gallon barrels	180,727	183,996	42,236	Italy 28,397; Netherlands 22,982
Refinery products:					
Liquefied petroleum gas	do.	(²)	27,945	1,763	France 11,822; Italy 6,704; Belgium-Luxembourg 3,022.
Gasoline, motor	do.	38,119	30,132	1,452	Netherlands 15,163; Japan 2,161.
Kerosene and jet fuel	do.	1,670	1,715	—	United Kingdom 483; Canada 297; Iran 155.
Distillate fuel oil	do.	36,370	29,778	700	Netherlands 17,238; France 6,149; Italy 2,450.
Lubricants	do.	9	10	—	Mainly to Tunisia.
Residual fuel oil	do.	39,975	32,577	26,291	Netherlands 2,92 ² ; France 2,437.

¹ Table prepared by Virginia A. Woodson.

² Unreported quantity valued at \$2,632,481,000.

a processing plant at El Hadjar, a distance of 170 kilometers. Both mines are operated by Entreprise Nationale de Fer et de Phosphates.

Iron and Steel.—At yearend, site preparation for the 2-million-ton-per-year-capacity Bellara steel complex, east of Algiers, was near completion by Algerian firms. Bids for the complex were invited in three lots: direct-reduction process plant, scrap yard, and harbor installations; electric arc furnace with continuous casting, water treatment plant, and electrical distribution network; and maintenance shop, stockyard, and repair area. Final decision on technical bids was anticipated in 1989. Possible bidders included Voest-Alpine Anlagenbau AG (Austria), Merlin

Gerin (France), Danieli Engineering (Italy), and C. Itoh Co. Ltd. (Japan).

Raw steel output, estimated at 750,000 tons annually, was produced at the Entreprise Nationale de Siderurgie's El Hadjar steel complex, the nation's sole steelworks. France's Concessionary Credit Agency, Caisse Centrale de Co-operation Economique, increased loans to Algeria in 1988 including \$22.3 million for a project designed to reduce coke consumption at El Hadjar.

Mercury.—Algeria was a significant world producer of mercury, supplying about 10% of the world's total output. Only the U.S.S.R. and Spain reported higher production. Entreprise Nationale des Nonferreux et Substances Utiles reported the average production cost of

mercury in Algeria at \$300 per flask. The price of mercury on the New York market in 1988 ranged from \$233 to \$370 per flask. A factor that contributed to the price improvement was the curtailment of U.S.S.R. exports to Europe at prices well below market levels. The reduced shipments were prompted by an antidumping claim filed with the European Commission by Spain against the U.S.S.R.

Industrial Minerals.—Phosphate Rock.—Production was derived from the Djebel Onk open pit mine 330 kilometers south of Annaba. Operated by Entreprise Nationale de Fer et de Phosphates, the deposit site covers 2,100 square kilometers and produced 1.3 million tons of processed phosphate. To

TABLE 3
ALGERIA: IMPORTS OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	1986	1987	United States	Sources, 1987
				Other (principal)
METALS				
Alkali and alkaline-earth metals	2	27	(²)	France 16; West Germany 7.
Aluminum:				
Oxides and hydroxides	796	187	(²)	France 126; West Germany 60.
Metal including alloys:				
Scrap	82	20	—	All from West Germany.
Unwrought	6,636	7,665	—	West Germany 2,994; Norway 1,801; Netherlands 1,005.
Semimanufactures	16,777	13,812	1	France 5,037; Italy 2,531; Egypt 1,496.
Beryllium: Metal including alloys, all forms	value, thousands \$6	—		
Chromium: Oxides and hydroxides	61	44	—	Netherlands 40; France 4.
Copper: Metal including alloys:				
Unwrought	1,182	418	—	France 307; West Germany 103.
Semimanufactures	16,947	24,496	7	Turkey 8,200; Saudi Arabia 5,650; France 4,605.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	—	387	—	Netherlands 200; Canada 140.
Metal:				
Scrap	20	3	—	All from West Germany.
Pig iron, cast iron, related materials	23,167	10,472	—	West Germany 6,281; Belgium-Luxembourg 2,840; France 759.
Ferroalloys:				
Ferromanganese	4,495	2,170	—	France 1,370; West Germany 759.
Unspecified	4,824	3,458	—	Norway 2,607; Brazil 440.
Steel, primary forms	18,593	22,014	—	West Germany 10,218; Netherlands 6,890; France 3,364.
Semimanufactures:				
Bars, rods, angles, shapes, sections	789,266	662,162	5	Brazil 159 766; Spain 118,649; Austria 99,065.
Universals, plates, sheets	154,408	76,917	—	West Germany 27,243; Belgium-Luxembourg 24,830; France 12,770.
Hoop and strip	10,279	6,856	3	France 2,705; West Germany 2,458; Belgium-Luxembourg 1,208.
Rails and accessories	38,870	24,745	6	France 17,863; United Kingdom 3,469.
Wire	42,354	33,914	1	Italy 14,566; West Germany 6,122; Belgium-Luxembourg 4,927.
Tubes, pipes, fittings	121,528	66,331	599	France 22,002; Tunisia 17,748; Italy 11,587.
Lead:				
Ore and concentrate	6	6	—	All from France.
Oxides	2,731	2,481	—	Switzerland 1,200; China 875; Italy 356.
Metal including alloys:				
Unwrought	17,025	16,214	643	Belgium-Luxembourg 5,198; Italy 3,960; Sweden 3,677.
Semimanufactures	393	55	(²)	France 49; Canada 5.

See footnotes at end of table.

TABLE 3—Continued
ALGERIA: IMPORTS OF MINERAL COMMODITIES¹
(Metric tons unless otherwise specified)

Commodity	1986	1987	Sources, 1987	
			United States	Other (principal)
METALS—Continued				
Magnesium: Metal including alloys:				
Unwrought	—	14	—	All from Norway.
Semimanufactures	36	21	—	United Kingdom 13; Japan 8.
Manganese:				
Ore and concentrate, metallurgical-grade	value, thousands	\$2	—	
Oxides	1,822	1,799	—	Belgium-Luxembourg 720; West Germany 690; France 300.
Mercury	value, thousands	\$22	\$3	— West Germany \$2; France \$1.
Molybdenum: Metal including alloys, all forms	do.	\$68	\$32	— Austria \$26; France \$6.
Nickel:				
Matte and speiss	—	3	—	Netherlands 2; France 1.
Metal including alloys:				
Unwrought	7	1	—	Mainly from France.
Semimanufactures	93	266	—	Canada 175; West Germany 29.
Platinum-group metals: Metals including alloys, unwrought and partly wrought	value, thousands	\$1,523	\$24	— France \$9; Spain \$8; Switzerland \$4.
Silver: Metal including alloys, unwrought and partly wrought	do.	\$4,411	\$2,025	— Belgium-Luxembourg \$1,169; France \$664.
Tin: Metal including alloys:				
Scrap	do.	\$2	—	
Unwrought	161	310	—	Malaysia 270; Belgium-Luxembourg 22.
Semimanufactures	130	55	—	West Germany 27; Italy 21.
Titanium: Oxides	15,251	9,791	228	West Germany 3,220; France 2,837; Belgium-Luxembourg 1,643.
Tungsten: Metal including alloys, all forms	5	—		
Zinc:				
Ore and concentrate	83,659	100,820	—	Canada 47,689; Sweden 41,326; West Germany 7,396.
Oxides	426	578	—	China 395; Netherlands 120.
Metal including alloys, semimanufactures	502	587	—	France 327; West Germany 122.
Other:				
Ores and concentrates	24	—		
Oxides and hydroxides	150	341	88	France 109; West Germany 106.
Base metals including alloys, all forms	58	156	—	Belgium-Luxembourg 75; China 40; Italy 37.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	156,205	29,217	2	Greece 28,695.
Artificial: Corundum	1,502	382	—	Austria 150; West Germany 80; France 32.
Dust and powder of precious and semiprecious stones including diamond	value, thousands	\$4	\$68	— Ireland \$42; France \$16.
Grinding and polishing wheels and stones	635	218	(³)	West Germany 79; Italy 56; France 40.

See footnotes at end of table.

TABLE 3—Continued

ALGERIA: IMPORTS OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	1986	1987	United States	Sources, 1987
				Other (principal)
INDUSTRIAL MINERALS—Continued				
Asbestos, crude	11,125	18,260	502	Canada 15,500; Republic of South Africa 2,218
Barite and witherite	50	—		
Boron materials:				
Crude natural borates	64	—		
Oxides and acids	103	36	—	China 20; Italy 13.
Cement thousand tons	2,920	1,663	34	Greece 593; Spain 341; Tunisia 309.
Chalk	37,917	35,069	—	France 31,779; Spain 2,345.
Clays, crude	10,492	13,713	—	United Kingdom 9,433; France 4,255.
Cryolite and chiolite value, thousands	\$50	\$10	—	All from France.
Diamond: Industrial stones do	\$345	\$247	—	Zaire \$227; Ireland \$20.
Diatomite and other infusorial earth	79	54	—	All from West Germany.
Feldspar, fluorspar, related materials	4,900	1,653	—	Norway 900; Turkey 360; Italy 350.
Fertilizer materials:				
Crude, n.e.s. value, thousands	\$846	\$1	—	All from Italy.
Manufactured:				
Ammonia	15	2	—	France 1; United Kingdom 1.
Nitrogenous	7,612	18,227	812	Romania 7,500; France 6,150; Jordan 3,000.
Phosphatic	118,983	172,239	—	Tunisia 88,970; Turkey 54,839; Iraq 15,730.
Potassic	71,588	102,681	—	Belgium-Luxembourg 41,656; Spain 41,372; East Germany 16,647.
Unspecified and mixed	52,888	53,790	—	Spain 30,025; Greece 18,300.
Graphite, natural	161	25	—	United Kingdom 18; France 4.
Gypsum and plaster	1,927	—		
Magnesium compounds, unspecified	697	1,229	—	Austria 1,100; France 104.
Mica:				
Crude including splittings and waste	149	88	—	All from France.
Worked including agglomerated splittings	2	1	—	Mainly from France.
Phosphates, crude	3	—		
Pigments, mineral: Iron oxides and hydroxides, processed	1,990	3,084	153	China 2,519; Italy 268.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	\$4	—		
Synthetic do.	\$2,702	\$2	—	All from Ireland.
Pyrite, unroasted	60	35	—	All from West Germany.
Salt and brine	105	283	—	United Kingdom 251; France 16.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	23,972	32,178	—	Italy 23,023; France 5,067.
Sulfate, manufactured	20,392	15,069	—	Italy 8,349; Belgium-Luxembourg 2,946; Libya 2,000.

See footnotes at end of table.

TABLE 3—Continued
ALGERIA: IMPORTS OF MINERAL COMMODITIES¹
(Metric tons unless otherwise specified)

Commodity	1986	1987	Sources, 1987		
			United States	Other (principal)	
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	14	50	—	All from France	
Worked	2,464	1	—	All from Canada	
Dolomite, chiefly refractory-grade	1,817	510	—	France 248; West Germany 161; Austria 61	
Gravel and crushed rock	153,209	103,010	—	Italy 98,782; France 4,228	
Quartz and quartzite	2,286	18	(^a)	Austria 12; France 6	
Sand other than metal-bearing	291	33	—	All from France	
Sulfur:					
Elemental:					
Crude including native and byproduct	77,978	126,888	—	France 85,184; Poland 25,708	
Colloidal, precipitated, sublimed	5	4,104	—	All from France	
Sulfuric acid	40	2,317	—	Spain 2,299	
Talc, steatite, soapstone, pyrophyllite	1,584	957	—	Spain 500; France 394	
Other: Crude	233	40	—	France 35; Belgium-Luxembourg 5	
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	3,907	2,226	11	Italy 804; West Germany 692; Spain 387	
Coal:					
Anthracite and bituminous	thousands tons	1,009	1,371	880	Australia 341; Poland 150
Briquets of anthracite and bituminous coal		—	59	—	All from France
Coke and semicoke		—	53,000	—	Japan 40,000; Yugoslavia 13,000
Peat including briquets and litter	value, thousands	\$1	\$130	—	Sweden \$116; Netherlands \$14
Petroleum refinery products:					
Liquefied petroleum gas	42-gallon barrels	12	35	—	Mainly from Belgium-Luxembourg
Gasoline, motor	value, thousands	\$168	\$222	—	Belgium-Luxembourg \$219
Mineral jelly and wax	42-gallon barrels	74,175	32,834	—	Spain 31,937; France 527
Kerosene and jet fuel	value, thousands	\$20,475	\$1,000	—	Belgium-Luxembourg \$867; France \$114
Lubricants	42-gallon barrels	609,644	294,861	70	France 158,088; Belgium-Luxembourg 96,593; Italy 24,115
Residual fuel oil	do.	4,995	—		
Bitumen and other residues	do.	614,860	415,801	—	Spain 393,900; Austria 21,228
Bituminous mixtures	do.	42,069	95,269	424	France 45,650; Italy 25,834; Austria 21,974
Petroleum coke	do.	407	—		

¹ Table prepared by Virginia A. Woodson.

² Less than 1/2 unit.

³ Unreported quantity valued at \$13,000.

⁴ Unreported quantity valued at \$35,000.

produce this amount, the mine handles 3 million tons of overburden and 3 million tons of phosphate-bearing material. The latter is processed by either wet or dry methods following crushing and screening. Water is supplied to the plant at a rate of 300 cubic meters per hour through a 90-kilometer-long pipeline. Both mine and plant were in virtually continuous operation. About one-third of the output was utilized at the Annaba fertilizer complex, and the remainder was exported principally to European markets.

Mineral Fuels.—Natural Gas.—Gross production of natural gas was 3.5 trillion cubic feet, less than 7% was flared, and nearly 50% was reinjected to maintain petroleum reservoir pressure. Export activities increased when Algeria made gas prices more flexible. As a result, Distrigas Corp. and Panhandle Eastern Corp. resumed contracts to import Algerian liquefied natural gas into the United States. The contracts had been suspended following disputes over prices in 1983 and 1985, respectively. At the close of 1987, Algeria shipped the first of 17 cargoes to Distrigas of Boston, Massachusetts, priced at \$2.60 per million British thermal units. A longstanding price dispute with Gaz de France was also resolved in 1988. A price structure for a 4-year period was agreed to, and the old pricing formula based on the official selling price of eight OPEC crude oils was abandoned.

The magnitude of investment necessary to develop natural gas liquefaction-shipment-regasification networks and the rigidity of the distribution patterns requires the signing of long-term purchase and sales contracts to ensure investment viability. Table 4 lists Algerian export contracts in effect during 1988.

Algeria exported nearly 900 billion cubic feet of natural gas to Europe in 1988 and provided 9% of Europe's natural gas requirements. More than one-half of this amount was shipped as liquefied natural gas. Algeria will supply 11% of the European natural gas

TABLE 4
**ALGERIA: LIQUEFIED NATURAL GAS EXPORT CONTRACTS
IN EFFECT OR PLANNED**

Country	Volume ¹ (billion cubic feet per year)	Liquefaction terminal	Regasification terminal	Contract duration
Belgium	100	Arzew	Zeebrugge	1982-2002
France	20	do.	Le Havre	1965-90
Do.	120	Skikda	Fos-Sur-Mer	1973-99
Do.	180	Arzew	Montoir de Bretagne	1982-2002
Greece	20	Skikda	Athens	1991-2011
Spain	135	do.	Barcelona	1975-2004
Turkey	70	do.	Ereglis	1992
United Kingdom	7	Arzew	Canvey Island	1988
United States	160	do.	Lake Charles, LA	1987-2003
Do.	45	do.	Everett, MA	1988-2004

¹ Most contracts offer some volume flexibility.

requirement when annual capacity of the Transmed pipeline is increased from its present 425 billion cubic feet to 580 billion cubic feet and when natural gas delivery contracts to Belgium and Spain reach full delivery rate.

After a 14-year breach, diplomatic relations were resumed between Algeria and Morocco with the signing of an agreement to ship natural gas to Spain through a second Transmed pipeline. This pipeline will originate at the Hassi R'Mel Field and extend to the border with Morocco at Oujda, through Fez to Tangier. It is scheduled for completion in 1995.

A protocol was signed in the early months of 1988 by Algeria, Libya, and Tunisia to construct a 415-kilometer natural gas pipeline from the junction of the Transmed pipeline at the Tunisian border, through Tunisia to Zuwara, on the Libyan coast. The construction cost was estimated at \$400 million. The line will deliver Algerian gas to fuel an 800,000-kilowatt power station at Zuwara and may provide a basis for future petrochemical and fertilizer plants at Zuwara.

Petroleum.—Exploration.—Exploration agreements based on the amended 1986 Hydrocarbons Code have been fi-

nalized with Azienda Generali Italiana Petroli S.p.A. (AGIP), Compania Espanola de Petroleos (Cepsa), and the Broken Hill Pty. Ltd. (BHP). Agreement terms call for a 50-50 split in development cost. Production is to be shared on a 35-65 basis in SONATRACH's favor for production up to 15,000 barrels per day (bbl/d). SONATRACH's share gradually rises to 87.5% for production in excess of 75,000 bbl/d.

AGIP activity was centered in Block 403 about 725 kilometers south of the Mediterranean coast and 208 kilometers west of Tunisia where development work on the Rom discovery will include construction of a pipeline from the field to the coast. Production startup was expected by late 1990 and was expected to reach an optimum production level of 30,000 bbl/d.

The Cepsa concession covered a 1,500-square-kilometer area in the eastern Erg region near Rhourde Yakoub.

BHP conducted exploration in the Rhourde-el-Lough and Sif Fatima blocks of the Ghadones Basin.

SONATRACH's exploration in the Erg region resulted in a discovery at Rhourde-El-Rouni about 350 miles east of Hassi Messaoud. An appraisal of the discovery was underway in 1988.

CFP-Total, working outside the new exploration terms, contracted for an 18-month seismic survey for SONATRACH. It included shooting two surveys in the Hassi Messaoud area, one in the northern Sahara, and a fourth in the southern region of Algeria.

Production.—Crude oil production averaged 650,000 bbl/d, well below the 667,000-bbl/d quota assigned by OPEC. Most of the production was derived from Hassi Messaoud-Haoud el Hamra Oilfields in the Algerian Sahara and the Zarzaitine-Edjeleh Field near Ohanet and in Amenas near the Libyan border. Field condensate production not limited by OPEC quotas averaged 470,000 bbl/d from petroleum and natural gasfields.

Refining.—SONATRACH operated four refineries with a combined distil-

lation capacity of 465,000 bbl/d and a 56,000-bbl/d catalytic reforming capacity. Refined product output averaged 460,000 bbl/d.

EGYPT³

Major sources of wealth for the Egyptian economy, petroleum and natural gas production, declined in 1988. This coincided with a drop in oil prices and a rise in wheat prices. Oil export revenues dropped, and wheat and flour imports rose during 1988. However, the Egyptian Government's new approach to mineral exploration and revenue-sharing concepts began to pay dividends during the year. Petroleum production had apparently peaked in 1987; however, the production of natural gas could be expected to rise owing to new

Government steps to induce exploration. The Government approved several dozen new oil exploration concession agreements with foreign companies to extend and enhance oil and natural gas production in Egypt.

Foreign exchange revenues rose in 1988 but remained less than the amount needed to finance a level of imports that would stimulate economic growth and meet the nation's large debt service obligations. The gross domestic product (GDP) for Egypt in 1988 was approximately \$43 billion.⁴ Real growth in GDP for 1988 was about 2.7% compared with 4.2% in 1987.

Negotiations with the International Monetary Fund (IMF) continued throughout 1988 with no substantive agreement reached. A rescheduling of debt by the IMF may not be forthcoming until at least 1989, owing to the ineffectiveness of the Egyptian 1987 Economic

FIGURE 1
1988 EGYPTIAN EXPORTS
(Value: \$3 billion)

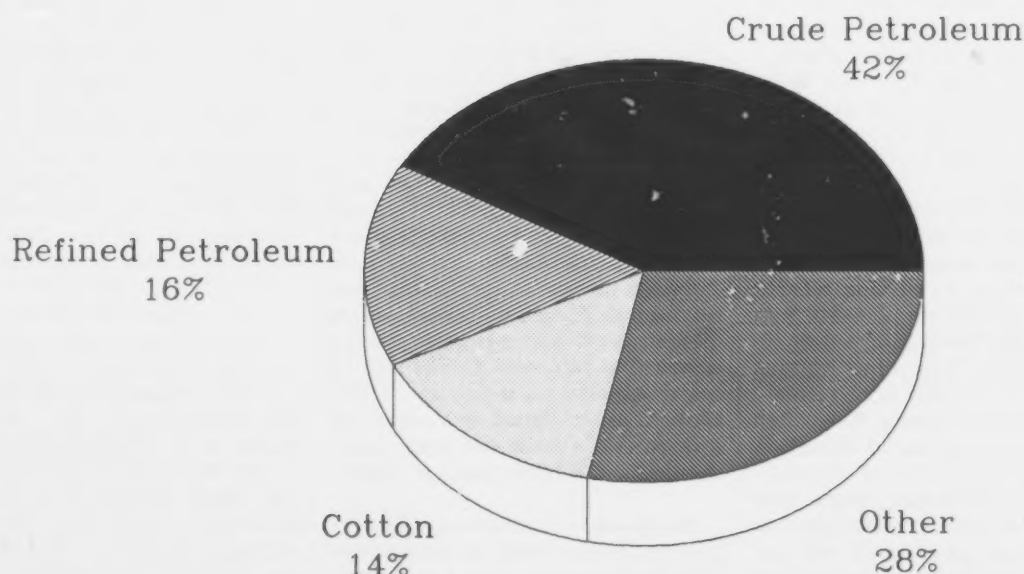


TABLE 5
EGYPT: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity		1984	1985	1986	1987 ^P	1988 [*]
METALS						
Aluminum metal		170,000	208,587	175,000	¹ 178,850	173,460
Copper, refined, secondary [*]		2,600	2,600	2,500	2,500	25,000
Iron and steel:						
Iron ore and concentrate	thousand tons	2,500	87	2,135	¹ 1,700	² 2,000
Pig iron	do.	225	225	121	46	² 132
Crude steel	do.	200	533	281	¹ 347	347
Semimanufactures	do.	500	500	NA	NA	NA
Ferroalloys: Ferrosilicon [*]		7,500	7,500	² 7,221	² 7,702	² 7,806
INDUSTRIAL MINERALS						
Asbestos		325	229	476	209	² 166
Barite		3,500	4,426	3,385	4,116	² 5,651
Cement: Hydraulic	thousand tons	6,500	5,749	7,612	8,746	² 9,787
Clays:						
Bentonite		3,000	3,000	5,126	3,827	² 3,166
Fire clay		250,000	250,000	364,300	148,727	150,000
Kaolin		120,000	108,378	127,784	125,256	² 24,122
Feldspar, crude		7,281	19,073	19,287	15,963	² 6,131
Fluorspar		¹ 810	85	80	776	² 1,849
Gypsum and anhydrite, crude		750,000	841,467	905,688	1,088,472	1,100,000
Lime [*]		97,500	97,000	95,000	95,000	95,000
Nitrogen: Ammonia, N content	thousand tons	686	684	680	788	² 485
Phosphate: Phosphate rock	do.	1,043	1,074	1,271	1,167	² 1,146
Salt, marine	do.	1,000	1,061	976	1,012	² 922
Sodium compounds:						
Sodium carbonate		40,000	49,108	[*] 50,000	[*] 45,000	² 47,711
Sodium sulfate		[*] 30,000	66,830	18,940	42,484	42,484
Stone, sand and gravel:						
Basalt	thousand cubic meters	100	720	899	1,044	1,050
Dolomite [*]	thousand tons	500	500	500	500	500
Graphite, dimension	cubic meters	4,000	4,000	2,938	2,000	2,000
Gravel	thousand cubic meters	7,500	10,736	11,214	11,200	11,000
Limestone and other calcareous n.e.s.	do.	10,000	12,059	13,476	14,785	5,000
Marble blocks (including alabaster)	cubic meters	17,500	43,312	40,000	27,814	² 13,000
Quartz		7,500	7,500	NA	NA	NA
Sand including glass sand	thousand cubic meters	1,500	12,677	13,122	246	252
Sandstone	do.	710	486	475	417	400
Sulfur:						
Elemental, byproduct [*]		4,000	3,000	7,300	7,600	7,600
Sulfuric acid		45,000	46,452	55,000	575,301	² 31,274
Talc, steatite, soapstone, pyrophyllite		12,213	7,700	8,800	[*] 7,500	² 7,268
Vermiculite		325	488	495	[*] 500	² 236

See footnotes at end of table.

TABLE 5—Continued

EGYPT: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity		1984	1985	1986	1987 ^P	1988 [*]
MINERAL FUELS AND RELATED MATERIALS						
Coke: Oven and beehive	thousand tons	950	895	908	[*] 900	² 936
Gas, natural:						
Gross production	million cubic feet	140,000	172,000	180,000	¹ 195,200	195,000
Marketed	do.	110,000	134,000	155,000	[*] 155,000	155,000
Petroleum and refinery products:						
Crude	thousand 42-gallon barrels	302,000	319,000	¹ 296,745	¹ 327,040	² 309,520
Refinery products:						
Gasoline and naphtha	do.	25,000	25,000	27,000	[*] 27,000	27,000
Kerosene and jet fuel	do.	20,000	20,000	20,000	[*] 20,000	20,000
Distillate fuel oil	do.	25,000	25,000	30,000	[*] 30,000	30,000
Residual fuel oil	do.	75,000	65,000	60,000	[*] 60,000	60,000
Lubricants	do.	1,000	1,000	1,000	[*] 1,000	1,000
Liquefied petroleum gas	do.	2,500	2,000	5,000	[*] 5,000	5,000
Asphalt	do.	2,500	2,500	2,000	[*] 2,000	2,000
Unspecified	do.	1,000	1,000	4,500	[*] 4,500	4,500
Refinery fuel and losses	do.	6,500	6,500	6,500	[*] 6,500	6,500
Total	do.	158,500	148,000	156,000	[*]156,000	156,000

^{*}Estimated. ^PPreliminary. ¹Revised. NA Not available.¹Table includes data available through July 15, 1988.²Reported figure.

Stabilisation Programme with the IMF and the May 1987 Paris Club agreement to reschedule \$6.5 million in debt payments. In the absence of a renegotiated agreement coupled with a 25% inflation rate, Egypt could face severe payment problems into the 1990's. The Government also took action during 1988 to regulate Islamic investment companies that lost tens of thousands of Egyptians' personal monetary savings. It was hoped that these companies could be converted to joint stock entities within 1 year, pending the necessary legislation.

However, positive gains were seen in non-oil exports, tourism, and diplomacy during the year. Egypt made impressive political moves as a nation from a non-aligned status to more positive ties with Arab neighbors. These developments were expected to yield more positive opportunities for economic advancement in the future.

Production and Trade

Total remittance from exports was approximately \$3 billion for 1988. Of this total, crude petroleum represented 41.7%, refined petroleum represented 15.7%, and cotton represented 14.4%. Imports were valued at about \$8 billion for 1988. The trade balance as a percentage of GDP for 1988 was -18.8% with a current account balance of -\$554 million. These figures were the result of increased international commodity prices, decreased remittances from Egyptian workers in the Persian Gulf and elsewhere (Egypt's major source of foreign exchange earnings), and sagging oil revenues. To offset these deficit accounts, Egypt sought to stimulate foreign investment in the petroleum industry. It was hoped that these efforts would generate revenue for 1989.

Principal nonpetroleum minerals in

Egypt are phosphates, iron ore, coal, clays, and cement. All of these commodities are utilized domestically and were not significant in international trade. In the mid-1980's, the Government tried to stimulate the development of Egypt's mineral resources in the face of an investment capital shortage. It extended to potential foreign investors a production-sharing concept utilized in the petroleum industry. This adaptation to the exploitation of mineral resources met with only modest results. Another problem was the relative lack of knowledge of Egypt's geology and commercial mineral deposits. Positive results were shown in 1988 with the addition of a project sponsored by the United States Agency for International Development (USAID) to train Egyptian Government staff and upgrade equipment. Continental Oil Co. sponsored a project to survey and

TABLE 6
EGYPT: EXPORTS OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	1986	1987	Destinations, 1987	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Unwrought	24	—		
Semimanufactures	101,555	107,307	—	Netherlands 56,552; Italy 23,952; Belgium-Luxembourg 6,596.
Copper: Metal including alloys:				
Scrap	421	—		
Unwrought	—	1,138	—	All to Italy.
Semimanufactures	745	383	—	Italy 360; Sudan 16.
Iron and steel:				
Iron ore and concentrate including roasted pyrite	30	—		
Metal:				
Scrap	—	547	—	Italy 310; Netherlands 238.
Ferroalloys	—	8,853	3,500	West Germany 3,053; Japan 1,200.
Steel, primary forms	13,682	26,390	4,400	Italy 9,963; United Kingdom 6,170.
Semimanufactures:				
Bars, rods, angles, shapes, sections	—	144	—	All to Sudan.
Universals, plates, sheets	19,686	13,254	—	United Kingdom 4,892; Italy 3,070; Sudan 2,966.
Hoop and strip	—	4,912	—	Italy 2,500; United Kingdom 922; Portugal 920.
Wire	3	13	—	All to Sudan.
Tubes, pipes, fittings	342	598	—	Do.
Castings and forgings, rough	37	116	—	Sudan 113.
Nickel: Metal including alloys, scrap	—	17	—	All to Saudi Arabia.
Zinc:				
Oxides	value, thousands	\$1	—	All to Bahrain.
Metal including alloys:				
Unwrought	1,262	200	—	All to India.
Semimanufactures	—	404	—	Do.
Other: Ashes and residues	601	699	—	Do.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones				
	—	3	—	All to Sudan.
Cement	1,052	2,000	—	Do.
Fertilizer materials: Manufactured:				
Nitrogenous	13,104	5,362	—	Greece 2,342; Jordan 1,500; Morocco 1,020.
Unspecified and mixed	—	20	—	All to Australia.
Phosphates, crude	71,770	68,650	—	Albania 44,750; Romania 13,500.
Pigments, mineral: Iron oxides and hydroxides, processed	137	256	—	Sudan 206; Lebanon 50.
Precious and semiprecious stones other than diamond: Natural				
value, thousands	\$5	—		

See footnotes at end of table.

TABLE 6—Continued
EGYPT: EXPORTS OF MINERAL COMMODITIES¹
(Metric tons unless otherwise specified)

Commodity	1986	1987	Destinations, 1987	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Salt and brine	13,013	180,276	—	Italy 84,350; Yugoslavia 21,500; United Kingdom 20,500.
Sodium compounds, n.e.s.: Carbonate, manufactured	—	1,550	—	All to Sudan.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked value, thousands	\$43	\$175	—	West Germany \$109; Jordan \$57.
Worked	—	915	(²)	West Germany 896.
Gravel and crushed rock value, thousands	\$92	\$148	—	All to Israel.
Sand other than metal-bearing	—	4,937	—	Kuwait 4,712; Cyprus 225.
Sulfur: Sulfuric acid	—	100	—	All to Sudan.
Talc, steatite, soapstone, pyrophyllite	843	345	—	East Germany 157; West Germany 154.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	—	30	—	All to Sudan.
Coal: Anthracite and bituminous	—	9	—	All to Israel.
Coke and semicoke	71,816	63,635	—	Romania 59,621; Tunisia 4,014.
Petroleum:				
Crude thousand 42-gallon barrels	52,191	72,166	10,861	Israel 18,705; Italy 15,554.
Refinery products:				
Liquefied petroleum gas do.	—	124	—	All to Yemen (Sanaa).
Gasoline, motor do.	33	88	—	India 65; West Germany 23.
Mineral jelly and wax do.	127	146	24	West Germany 121.
Kerosene and jet fuel do.	3,797	5,566	—	France 2,131; Italy 2,103.
Distillate fuel oil do.	965	925	—	All for bunkers.
Lubricants do.	35	—	—	
Residual fuel oil do.	12,115	11,066	—	Italy 2,935; France 1,620; bunkers 5,814.
Bitumen and other residues do.	—	12	—	All to Greece.

¹ Table prepared by Virginia A. Woodson.

² Unreported quantity valued at \$2,000.

publish a 1:500,000 scale geological map, to be made available through the state oil company Egyptian General Petroleum Co. (EGPC). Additionally, the Government revised its bureaucratic structure to transfer new mineral exploration and exploitation from the Ministry of Industry to the Ministry of Petroleum (renamed the Ministry of Petroleum and Mineral Wealth). This restructuring will enable foreign investors to deal solely with EGPC instead of multiple ministries.

During 1988, the volume of shipping

in the Suez Canal generated \$1.27 billion. Shipping traffic was expected to decline in 1989.

Commodity Review

Metals.—Gold.—Commercial development of Egypt's gold resources continued during the year. The United Kingdom's Minex, a subsidiary of Greenwich Resources, conducted exploration and development of gold prospects in the Eastern Desert near the Port of Safage.

Drilling was carried out over Minex' 5,000-square-kilometer El Sid Prospect in the Red Sea Hills (including El Sid South and Hammaa) and at old surface workings at Abu Marawat. At Abu Marawat the company isolated two disseminated gold and silver mineralized veins. They were the "Fin" vein, with a width of 5.8 meters at grades of 6.2 grams per ton (g/t) gold and 84 g/t silver; and the "C" vein, at a depth of 60 meters, with a width of 6.5 meters at grades of 4.4 g/t gold and 51.8 g/t of

TABLE 7
EGYPT: IMPORTS OF MINERAL COMMODITIES¹
(Metric tons unless otherwise specified)

Commodity	1986	1987	Sources, 1987		
			United States	Other (principal)	
METALS					
Alkali and alkaline-earth metals	31	1	—	Mainly from France.	
Aluminum:					
Ore and concentrate	1,060	—			
Oxides and hydroxides	27,401	1,659	84	West Germany 1,193; India 200.	
Metal including alloys: Semimanufactures	3,085	2,704	11	Italy 744; West Germany 608; France 441.	
Chromium: Oxides and hydroxides	—	10	—	Romania 6; West Germany 2.	
Cobalt: Oxides and hydroxides	10	1	—	All from United Kingdom.	
Columbium and tantalum: Metal including alloys, all forms, tantalum	(^a)	8	—	West Germany 5; France 3.	
Copper:					
Matte and speiss including cement copper	1,030	—			
Metal including alloys:					
Scrap	23	11	—	All from ship stores.	
Unwrought	697	5	—	All from United Kingdom.	
Semimanufactures	9,248	11,755	445	Turkey 4,096; Greece 1,524; West Germany 1,095.	
Iron and steel:					
Iron ore and concentrate excluding roasted pyrite	67,425	538,931	67,657	Brazil 349,278; United Kingdom 121,996.	
Metal:					
Scrap	1,539	1,992	—	NA.	
Pig iron, cast iron, related materials	29,196	983	—	Italy 387; Spain 216; Brazil 100.	
Ferroalloys:					
Ferromanganese	5,371	16,415	—	France 8,707; United Kingdom 6,999.	
Unspecified	93	64	—	West Germany 32; Yugoslavia 20.	
Steel, primary forms	value, thousands	\$33,698	\$25,513	—	United Kingdom \$8,461; West Germany \$5,338; Sweden \$4,369.
Semimanufactures:					
Bars, rods, angles, shapes, sections	1,674,958	824,333	8,590	Czechoslovakia 209,347; Yugoslavia 133,238; Romania 125,971.	
Universals, plates, sheets	79,810	195,857	27,751	West Germany 31,725; France 16,144; Italy 14,696.	
Hoop and strip	3,183	965	11	West Germany 365; East Germany 175; Belgium-Luxembourg 156.	
Rails and accessories	2,785	15,012	—	Poland 6,498; Austria 6,072; Republic of Korea 1,143.	
Wire	15,316	18,112	2	China 4,750; Poland 3,067; West Germany 2,293.	
Tubes, pipes, fittings	value, thousands	\$131,291	\$115,437	\$10,947	Switzerland \$15,822; Italy \$12,977; West Germany \$11,704.
Castings and forgings, rough	24,066	22,643	664	Romania 5,160; West Germany 3,867; Republic of Korea 3,243.	

See footnotes at end of table.

TABLE 7—Continued
EGYPT: IMPORTS OF MINERAL COMMODITIES¹
(Metric tons unless otherwise specified)

Commodity	1986	1987	Sources, 1987	
			United States	Other (principal)
METALS—Continued				
Lead:				
Oxides	2,507	1,790	54	East Germany 725; West Germany 451; Bulgaria 368.
Metal including alloys:				
Scrap	375	561	—	Sudan 315; United Kingdom 246.
Unwrought	7,710	15,807	—	Switzerland 4,701; Morocco 2,253; Spain 1,876.
Semimanufactures	5	71	7	West Germany 57; Republic of Korea 5.
Magnesium: Metal including alloys:				
Scrap value, thousands	—	\$7	—	All from West Germany.
Unwrought	9	50	—	Yugoslavia 47.
Semimanufactures	—	4	—	United Kingdom 3; West Germany 1.
Manganese:				
Ore and concentrate: Metallurgical-grade	263	408	—	All from Belgium-Luxembourg.
Oxides	769	505	180	Belgium-Luxembourg 307.
Mercury 76-pound flasks	551	522	—	Spain 493; Netherlands 1.
Molybdenum: Metal including alloys, all forms value, thousands	—	\$46	—	All from Netherlands.
Nickel:				
Matte and speiss	—	40	—	All from United Kingdom.
Metal including alloys:				
Scrap	—	21	—	Do.
Unwrought	88	56	—	United Kingdom 31; France 10.
Semimanufactures	105	110	—	West Germany 45; Canada 21.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands				
	\$35	\$354	—	All from West Germany.
Silver: Metal including alloys, unwrought and partly wrought do.	\$162	\$1,677	\$20	Switzerland \$866; West Germany \$775.
Tin: Metal including alloys:				
Scrap	3	4	—	All from Sudan.
Unwrought	262	186	—	Malaysia 120; Spain 30; Belgium-Luxembourg 29.
Semimanufactures	16	24	—	Singapore 8; Republic of Korea 6.
Titanium: Oxides	424	1,085	205	Czechoslovakia 213; West Germany 197.
Tungsten: Metal including alloys, all forms	2	9	—	All from Netherlands.
Zinc:				
Oxides	623	295	69	Yugoslavia 103; Belgium-Luxembourg 50.
Metal including alloys:				
Unwrought	11,412	7,158	—	Zaire 4,403; France 1,475; Somalia 1,001.
Semimanufactures	92	19	—	NA.

See footnotes at end of table.

TABLE 7—Continued
EGYPT: IMPORTS OF MINERAL COMMODITIES¹
(Metric tons unless otherwise specified)

Commodity	1986	1987	Sources, 1987	
			United States	Other (principal)
METALS—Continued				
Other:				
Oxides and hydroxides	35	2,189	—	Republic of Korea 2,007; Netherlands 62.
Base metals including alloys, all forms	2,521	1,781	—	Switzerland 1,107; West Germany 351.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	51	434	69	Greece 188; Italy 153.
Artificial: Corundum	79	52	—	All from West Germany.
Dust and powder of precious and semiprecious stones including diamond value, thousands	—	\$17	—	All from United Kingdom.
Grinding and polishing wheels and stones	1,996	3,170	—	Italy 1,446; Yugoslavia 511; China 292.
Asbestos, crude	1,949	9,300	—	Canada 4,337; Cyprus 2,080; Republic of South Africa 2,006.
Barite and witherite	7,281	—		
Boron materials: Oxides and acids	428	352	—	Italy 171; Turkey 100; West Germany 75.
Cement value, thousands	6,702	3,823	—	Greece 1,362; Romania 978; Jordan 519.
Chalk	265	427	—	France 254; United Kingdom 160.
Clays, crude	34,593	31,317	289	United Kingdom 23,973; Cyprus 2,238.
Cryolite and chiolite	—	11	—	West Germany 10; Switzerland 1.
Diamond: Industrial stones value, thousands	\$103	—		
Diatomite and other infusorial earth	322	747	—	West Germany 472; Spain 270.
Feldspar, fluorspar, related materials	8,331	9,079	—	Turkey 8,101; Italy 400.
Fertilizer materials:				
Crude, n.e.s.	8	—		
Manufactured:				
Ammonia	91	141	—	Netherlands 140.
Nitrogenous	175,630	122,165	—	U.S.S.R. 90,675; Romania 31,472.
Potassic	35,394	31,713	—	Switzerland 31,663.
Unspecified and mixed	442	756	121	West Germany 298; Switzerland 215.
Graphite, natural	165	1,365	—	China 924; Italy 207.
Lime	9	—		
Magnesium compounds, unspecified	2,289	8,484	2	Turkey 5,000; Japan 1,904.
Mica:				
Crude including splittings and waste	28	14	—	All from India.
Worked including agglomerated splittings	4	3	—	Mainly from Belgium-Luxembourg.
Pigments, mineral: Iron oxides and hydroxides, processed	5,461	5,324	20	China 2,852; India 741; West Germany 739.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	—	\$111	\$12	Belgium-Luxembourg \$94.
Synthetic do.	\$3,596	\$149	\$97	West Germany \$51.

See footnotes at end of table.

TABLE 7—Continued

EGYPT: IMPORTS OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	1986	1987	Sources, 1987	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Pyrite, unroasted	203	4	—	All from West Germany.
Salt and brine	623	812	—	Netherlands 662; West Germany 150.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	1,023	8,556	—	Poland 3,012, Romania 2,778; Bulgaria 1,546.
Sulfate, manufactured	27,240	48,140	—	Belgium-Luxembourg 22,705; Italy 10,900; Romania 6,431.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked value, thousands	\$8,704	\$1,697	—	Italy \$806; Belgium-Luxembourg \$666.
Worked	1,003	698	—	Jordan 476; Italy 131.
Dolomite, chiefly refractory-grade	380	241	—	France 205.
Gravel and crushed rock	1,798	1,521	3	Italy 600; Czechoslovakia 470; France 391.
Quartz and quartzite	33	435	—	Italy 422.
Sand other than metal-bearing	337	487	—	Belgium-Luxembourg 327; West Germany 117.
Sulfur:				
Elemental:				
Crude including native and byproduct	69,921	110,312	20,000	Iraq 36,795; Saudi Arabia 19,375; Romania 19,041.
Colloidal, precipitated, sublimed	9,060	38	—	All from West Germany.
Sulfuric acid	85	4	(³)	West Germany 2; Sweden 1.
Talc, steatite, soapstone, pyrophyllite	975	1,570	—	Finland 1,122; Norway 301.
Other: Crude	447	731	252	Italy 240; Cyprus 173.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	3,722	4,490	1,140	Italy 970; France 960.
Coal:				
Anthracite and bituminous thousands tons	1,185	1,310	492	U.S.S.R. 478; Australia 340.
Lignite including briquets	—	1	—	All from Jordan.
Coke and semicoke	5,019	42	—	All from United Kingdom.
Peat including briquets and litter	3,212	618	19	West Germany 268; Belgium-Luxembourg 143.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	927	1,774	—	Greece 838; Italy 723.
Gasoline do.	3	—	—	
Mineral jelly and wax do.	16	2	(³)	West Germany 1.
Kerosene and jet fuel do.	(⁴)	147	23	Kuwait 51; Israel 35.
Distillate fuel oil do.	5,125	4,106	—	Kuwait 2,305; Israel 1,445.
Lubricants do.	679	295	38	Spain 63; United Kingdom 51.
Bitumen and other residues do.	—	(³)	—	All from West Germany.
Bituminous mixtures do.	1	1	—	Mainly from France.

NA Not available.

¹ Table prepared by Virginia A. Woodson.² Unreported quantity valued at \$32,000.³ Less than 1/2 u.i.t.⁴ Unreported quantity valued at \$24,258,000.

silver (maximum average grade of 2.8 g/t gold and 70.9 g/t silver over a width of 16 meters). Geologically, the area was a 100-meter wide hydrothermal gold-rich mineralized zone on the western side of the Fawakhir granite body. Gold metal content was estimated at 10 tons. With more detailed work, it is expected to define about 1 million tons of material suitable for open pit mining.

Iron and Steel.—Iron ore was mined at the sedimentary deposits in the Bahariya Oasis of the Western Desert. Production was about 2 million tons per year with the ore transported by rail 350 kilometers to the Helwan iron and steel complex south of Cairo. It was operated by the state-owned Iron and Steel Co. Capacity at the Helwan plant will be raised from 900,000 tons per year to 1.5 million tons per year by 1995. Financing was to originate from \$250 million in loans from the World Bank and a loan of \$120 million from the Soviet Union. The Soviet loan was to be used to modernize the high-blast furnaces and to supply an oxygen plant to improve the quality of steel from the Helwan complex. Additionally, the Soviet Union had agreed to upgrade production to 3 million tons per year by 1997. The Soviet Union was also financing the construction of a major iron and steel complex, on the Red Sea, with a capacity of 4 million tons per year at a cost of \$1.4 billion.

Egypt's largest private sector venture was the construction of the El Dikheila steel complex, near Alexandria, which was completed in 1986. Production was 1.15 million tons per year, about 900,000 tons short of demand.

Other Metals.—The Egyptian Government's latest technical and economic feasibility study on vanadium and titanium ore was conducted during 1973–75. The study revealed proven ore reserves of approximately 41 million tons with about 8.5 million tons of the ore outcropping on the surface. The study also showed that vanadium was within the economi-

cally feasible amount to be invested together with titanium.

The Egyptian Geological Survey and Mining Authority (EGSMA) had a project underway in 1988 to extract tin from cassiterite along the Red Sea coast. When fully developed, the project is expected to eliminate about 20% of Egypt's tin imports.

Industrial Minerals.—Cement.—Egyptian cement production continued its strong growth during the year. Cement production for the fiscal year ending September 1988, was 12.1 million tons, about 19% more than the 10.2 million tons in 1987. Cement production goals for 1988–89 were 13.8 million tons. Because of increased production, cement imports have dropped from 5.4 million tons to 3.3 million tons for 1988. The Federal Republic of Germany's Kloeckner-Humboldt-Deutz, France's Fives-Cail Babcock S.A., Japan's consortium of Kobe Steel Co. and Mitsubishi Corp., and Romania's Uzinexportimport bid on contracts to build 3 cement plants in Upper Egypt. Only 2 of these cement projects were still being considered, one plant at El Minya and the other at Beni Suef II. Each plant had a projected output of 3,300 metric tons per day. The third project was shelved owing to a lack of bids. Additionally, two new 3,700-metric-ton-per-day clinker cement production lines were still under construction at Helwan Portland Cement Co.'s Asyut plant. National Cement Co.'s Tabbin plant was in the process of commissioning a 4,500-metric-ton-per-day kiln line during 1988.

Fertilizer Materials.—Egypt's only phosphoric acid plant had a capacity of 66,000 tons per year and was operated by Abu Zaabal Fertilizer and Chemicals Co. at Abu Zaabal, northeast of Cairo.

Italy's Technipetrol submitted a bid of \$66 million for a natural gas-driven ammonia plant to replace an existing facility at Suez. It will have a design capacity of 400 tons per day of ammonia.

Work started on an ammonium ni-

trate plant in Alexandria during the year with a production capacity of 1,000 tons per day of ammonia, 1,800 tons per day of nitric acid, and 2,300 tons per day of ammonium nitrate. The builder of the \$215 million plant was the Abu Qir Co. for Fertilizers and Chemicals Industries.

Phosphate Rock.—Phosphate rock production increased approximately 4% in 1988 to 1.14 million tons from 1.1 million tons in 1987. Average P_2O_5 content of the mined rock was 25% and was obtained principally from mines near the Red Sea ports of Quseir and Safaga and at Sebaiya on the River Nile, south of Luxor.

The Misr Phosphate mine and plant in Hamrawein was undergoing a feasibility study to expand capacity from 198,000 to 1.3 million tons per year of phosphoric oxide. Additionally, the Red Sea Phosphate in Abu Tartour was undergoing construction to increase capacity from 2.2 million to 3.8 million tons per year by the 1990's.

Most of the mined output of phosphate rock was utilized domestically for fertilizer production. Total exports of phosphate rock was approximately 267,000 tons, chiefly to East Europe and Asia.

The Government conducted an economic feasibility study during the year on constructing a plant for producing uranium. The proposed plant would be built in the Abu Zaabal industrial region, northeast of Cairo, at an estimated cost of \$9 million. Uranium would be recovered from phosphate rock that was mined at the West Sebaiya mine, which was processed at the phosphoric acid operations of Abu Zaabal Fertilizer and Chemical Co.

Sulfur.—The northern Sinai was the site of a sulfur discovery in 1987 by the Freeport Egyptian Sulfur Co., a wholly owned subsidiary of Freeport-McMoran Inc. of the United States. The sulfur body was a 38-meter-thick bed with a length of 3 kilometers and a depth of 360 to 400 meters. The concession was in the

North Sinai Desert near the town of El Arish on the Mediterranean Sea and covers approximately 1,217 square kilometers. Sulfur mining was to begin within 2 years at an initial rate of 250,000 tons per year with production increasing to 1 million tons per year. This amount would be sufficient to meet the needs of the nation's chemical and phosphate industries. The concession agreement was based on revenue sharing and included a royalty payment with Freeport-McMoran marketing the product for themselves and the state-owned component of the enterprise. Additionally, Freeport-McMoran signed a second sulfur concession in the Eastern Desert region along the Gulf of Suez in 1988.

Mineral Fuels.—Coal.—Coal mining remained marginal in 1988 but efforts were undertaken to develop additional coal reserves. Egypt's Sinai Coal Co. along with the United Kingdom's British Mining Consultants and Babcock Contractors Ltd. started ground work during the year to develop the Maghara coal mine discovered in the Egyptian controlled north Sinai Peninsula. The coal mine was originally abandoned during the 1967 Egyptian-Israeli conflict. Coal reserves were estimated at about 27 million tons, and the proposed operation had a startup date of 1991 at an annual capacity of approximately 125,000 tons per year and rising to 750,000 tons per year in 5 years. This operation could save the Government \$42 million per year in coal imports.

Natural Gas and Petroleum.—Average oil production was approximately 848,000 bbl/d for 1988. Total Egyptian oil production in 1988 was about 309.5 million barrels. Production for the year declined when compared to the 1987 production figure of approximately 327 million barrels. Petroleum exports generated \$850 million in revenue. Analysts believe that the best Egyptian oil fields were relatively mature and that the new fields in the Western Desert

were less productive. They predicted a decline in petroleum production and a lower contribution to the GDP over the next 4 years.

Accessible natural gas reserves were estimated at 10 trillion cubic feet but exploitation costs were uncertain owing to the gas being trapped in relatively small pockets. During the year, the Government sought to encourage the exploration and development of natural gas by adopting a production sharing concept for the gas sector. Prior to this, all natural gas was owned by the Government.

EGPC revitalized the Ras al-Gharib Oilfield using computer analysis and water injection processes to generate needed export revenues. The formerly unreachable reserves (depth 1,200 meters) were being extracted by drilling several new wells about 14 kilometers from the central field in the Eastern Desert and injecting water to upgrade oil removal capacity from 7% to 14%. The field was near export centers of the gulf coast and was currently producing 20,000 bbl/d with a projected lifetime of 10 to 20 years. Expected production was 400 million barrels or 14% of all Egyptian petroleum.

Egypt awarded contracts to Amoco in the 194-square-kilometer North October area in the Gulf of Suez with a \$16 million development cost for three wells in 3 years. The British Petroleum Co. was awarded a Gulf of Suez 169-square-kilometer tract at Abu Zeneima at a cost of \$25 million for four wells in 5 years.

LIBYA⁵

The declining world petroleum market had further negative effects on the Libyan economy in 1988. However, petroleum continued to be Libya's major industry. During the year, Libya began to show a more conciliatory and open economic attitude toward neighboring North African nations and toward Italy, Libya's biggest trading partner. The United States trade, financial, and other

sanctions against Libya continued in 1988. Libya maintained 2d place among African oil producers and 16th place among petroleum producers worldwide. Nigeria continued to be the top African oil producer. Libya had estimated reserves of 22 billion barrels by yearend, mostly high-quality light crudes. Libyan natural gas reserves were estimated at 25.7 trillion cubic feet.

Libya's balance of payments worsened significantly in 1988 owing to low world oil prices. The current-account deficit for 1988 was approximately \$1.3 billion compared with \$800 million for 1987. The oil exports for 1988 were valued at \$5.2 billion,⁶ a drop of nearly 50% from the 1985 value.

Due to slumping oil revenues and foreign exchange losses, Libya continued to diversify its petroleum revenues by seeking to acquire new refining capacity overseas and by increasing output of value-added petrochemicals and refinery products. The Government created a new downstream petroleum investment vehicle to oversee Libyan foreign investments in energy, the Oil International Investment Co. (OIIC). The new company immediately took over the Government's 70% majority share in Tamoi Italia, a major Italian refiner and distributor. Additionally, OIIC purchased a 50% share in Coastal Corp.'s 80,000-bbl/d refinery in Hamburg, Federal Republic of Germany. OIIC had capital assets of \$450 million; its equity owners were Libya's National Oil Co. (NOC), Libyan Arab Foreign Investment Co., and the Libyan Arab Foreign Bank.

Libya's biggest project, the Great Manmade River (GMR), continued to be a budgetary priority during the year. The project consisted of artesian fresh water from wells in the southwestern desert being pumped to agricultural centers in northern Libya. Dong Ah Construction Co. and Korea Express, both of the Republic of Korea, won the GMR phase 1 contract, worth \$3.3 billion, in November 1983. Companies reported that work on phase 1 proceeded well in 1988 and that water

could be flowing through some pipes by fall 1989. Approximately 750 kilometers of pipes to Sirte have been laid, with about 900 kilometers excavated. Two concrete pipe factories were constructed to support the GMR. By the end of 1988, they had produced 130,000 pieces of pipe, half the required amount for the project. The GMR was expected to be completed by 1991.

Negotiations for phase 2 of the GMR contract took place during the year. Final bidding on the \$2.2 billion to \$3 billion project was scheduled for 1989.

Production and Trade

Libya's main sources of foreign exchange continued to be its exports of crude oil and petrochemicals. Exploration and production of crude oil in

Libya still required the support and technology of other industrialized countries. During the year, Yugoslavia's Hidromontaza signed an agreement with Sirte Oil Co. to supply, install, and commission equipment for processing liquid gas. Additionally, the Federal Republic of Germany's MAN Gutehoffnungshuette had won a contract with the Arabian Gulf Oil Co. (Agoco), a subsidiary of NOC, to supply and renovate electrical equipment at the Nafoora Oilfield and to install a gas compressor and undertake tank repairs at the Beida and Messla Oilfields.

Production of crude oil was estimated in excess of 1.1 million bbl/d, about 1% more than in 1987. Total crude production was approximately 374 million barrels for 1988.

Libya's crude oil production for the year may have exceeded by at least 2% its 1988 quota of 996,000 bbl/d, as set by OPEC. OPEC quotas for Libya in the first half of 1989 were set at 1,037,000 bbl/d. In July 1988, the prices of Libyan crudes Zuweitina, Sirtica, Brega, Es-Sider, Amna, and Sarir were standardized with the price of North Sea Brent crude. Oil that was bartered to pay debts and purchase capital equipment was priced in line with OPEC-agreed prices.

Libya continued its barter trade agreements, which included substituting oil for currency payments, with several countries. In September 1988, the Indian construction company Unitech took \$6.5 million worth of oil in payment for its contract work. Several other Indian companies withdrew

TABLE 8
LIBYA: PRODUCTION OF MINERAL COMMODITIES¹

Commodity		1984	1985	1986	1987 ^b	1988 ^a
Cement, hydraulic ^a	thousand metric tons	6,000	6,500	³ 2,077	³ 2,700	2,700
Gas, natural: ^a						
Gross	million cubic feet	295,000	292,000	292,000	292,000	292,000
Marketed ⁴	do.	150,000	150,000	150,000	150,000	150,000
Gypsum ^a	thousand metric tons	180	180	180	180	180
Iron and steel: Crude steel ^a	metric tons	10,000	10,000	10,000	10,000	10,000
Lime ^a	thousand metric tons	260	260	260	260	260
Nitrogen: N content of ammonia	do.	494	411	351,986	^a 350	350
Petroleum:						
Crude	thousand 42-gallon barrels	¹ 405,515	392,375	389,090	367,555	³ 374,125
Refinery products:						
Gasoline	do.	4,745	5,475	5,110	7,000	7,000
Kerosene and jet fuel	do.	5,475	5,840	^a 6,935	11,000	11,000
Distillate fuel oil	do.	9,490	10,585	^a 17,885	15,000	15,000
Residual fuel oil ¹	do.	16,060	18,615	^a 20,805	15,000	15,000
Other	do.	9,470	5,840	^a 3,285	1,000	1,000
Refinery fuel and losses	do.	1,825	1,825	^a 2,190	2,000	2,000
Total	do.	47,085	48,180	61,320	51,000	51,000
Salt	metric tons	12	12	12	12	12
Sulfur, byproduct of petroleum and and natural gas ^a	do.	14	14	14	14	14

^aEstimated. ^bPreliminary. ¹Revised.

¹Table includes data available through Mar. 25, 1988.

²In addition to the commodities listed, a variety of construction materials (sand and gravel, crushed stone, brick, and tile) is produced, but available information is inadequate to make reliable estimates of output levels. Natural gas liquids are also produced but are blended with crude petroleum and are reported as part of that total.

³Reported figure.

⁴Excludes gas reinjected into reservoirs.

from proposed oil-for-debt swap agreements in 1988 because of falling crude oil prices and warnings by the state-owned Reserve Bank of India that a loss of more than 15% on crude sales could not be tolerated. Libya agreed to resume oil deliveries to Ghana after a 5-year hiatus following Ghana's failure to meet payments for the crude in 1983. Libya agreed to reschedule the oil debts without interest, but no agreement on the timing of the new shipments was made. Uganda received \$6 million in petroleum products from Libya in 1988. The products were shipped from Libya to Dar es Salaam in Tanzania and then by rail to Uganda. Libya negotiated an agreement in November with Malta to renew oil supplies in 1989. The \$38 million in petroleum products consisted of 191,400 barrels of liquefied petroleum gas (LPG), 525,000 barrels of fuel oil for power stations, and 525,000 barrels of fuel oil for industry. Malta was an important transportation and shipping center for Libya. Malta's Sea Services, a leading supply ship operation, was responsible for the towing of the Scarabeo 4 offshore oil rig from Malta to the Libyan offshore Bouri Oilfield.

Commodity Review

Metals.—Iron and Steel.—The Misurata iron and steel plant failed to start up during 1988 as planned. The \$6 billion plant, 130 kilometers east of Tripoli, was to be the largest industrial enterprise in Libya. The delay in 1988 makes it several years behind schedule. Problems with power supply and financing were two of the main delaying factors in 1988. The Misurata iron and steel plant's phase 1 commercial production, with a designed annual capacity of 1,324,000 tons of liquid steel, was rescheduled to begin officially in September 1989. The plant's 480-megawatt power station, contracted to Hyundai Engineering & Construction Co. of the Republic of Korea, was expected to be completed in early 1989. Two of the power station's six generators

were undergoing tests in late 1988 and will be used to power the direct-reduction plant. The first iron pellets from Brazil's Cia. Vale do Rio Doce were to arrive in March 1989. The large volumes of gas to be used to reduce the iron pellets will be supplied by Libya from domestic production.

Industrial Minerals.—Cement.—Libya had a mill capacity of 6.5 million metric tons of cement per year and a clinker capacity of 6.4 million metric tons per year.

Mineral Fuels.—Natural Gas.—An agreement was signed during the year among Libya, Algeria, and Tunisia for the laying of a gas pipeline from Algeria to Libya through Tunisia. The proposed pipeline would carry an estimated 90 million cubic meters of Algerian gas.

Petroleum.—Exploration.—A series of accords were signed during the year between Libya and Tunisia for joint exploration of the Gulf of Gabes oil reserves. Agreement was also reached between the two countries on the development of a section of the Continental Shelf once claimed by Tunisia but awarded to Libya by an International Court of Justice ruling in December

1985. Libya gained approximately 3,367 square kilometers of seabed with hydrocarbon potential.

North African Geophysical Exploration Co. (Nageco) had three seismic crews doing onshore surveys during the year. NOC owned 51% of the venture; the remainder was owned by Western Geophysical Co. of Canada.

Production.—The African Petroleum Producers' Association (APPA) was formed in January 1987 and consisted of eight African oil exporting countries (Algeria, Angola, Benin, Cameroon, Congo, Gabon, Libya, and Nigeria). Of the APPA members, only Nigeria produced more oil than Libya in 1988.

The most notable event of the year for Libyan oil production was the inauguration of the first offshore field. The Bouri offshore oilfield had a phase 1 development cost of \$1.5 billion and was 93 kilometers northwest of Tripoli in the Gulf of Gabes. The field was 3 kilometers wide by 20 meters long and was covered by a water depth of 558 meters. The field was jointly developed by NOC and Italy's Agip-North Africa Middle East after its discovery in 1976. Production commenced in August 1988 at 8,000 bbl/d and was to be increased to 50,000 bbl/d by yearend. The Bouri

TABLE 9

LIBYA: 1988 AVERAGE DAILY PRODUCTION OF NATURAL GAS

Company, plant, location	Production—1,000-gallons per day (12-month average)		
	LP-gas mix	Raw NGL mix	Other
Oasis Oil Co. of Libya Inc.			
Bahi, Concession 32	—	—	160.0
Dahra, Concession 32	—	—	11.0
Defa, Concession 59 and 71	—	—	210.0
Waha, Concession 59W	—	—	170.0
Occidental of Libya Inc.			
103A, Sirte Basin, Petroleum Zone II	—	666.0	—
103D, Sirte Basin, Petroleum Zone II	—	375.0	—
Socialist People's Libyan Arab Jamahiriya, Marsa Brega	37.8	4,536.0	—
Total	37.8	5,577.0	551.0

Source: Oil and Gas Journal, July 11, 1988.

Field contains an estimated 5 billion barrels of oil and 2.5 trillion cubic feet of gas reserves with production levels planned to increase by 150,000 bbl/d by 1990. It was estimated that production can be maintained at this level for 35 years without enhanced recovery. Subsequently, Libya informed OPEC of its desire to avoid exceeding its quota by cutting back light crude production from onshore fields as the Bouri Field output increases.

Refining.—Libya's three older oil refineries had a total throughput crude oil capacity of 329,400 bbl/d, with catalytic reforming accounting for 13,982 bbl/d. The three refineries and their capacities at yearend were the Azzawiya Oil Refining Co. at 120,000 bbl/d, Ras Lanuf Oil and Gas Processing Co. at 201,000 bbl/d, and Sirte Oil at 8,400 bbl/d. Additionally, a new oil refinery opened in Tobruk in early April. The new facility, in Butnam municipality, had a capacity of 220,000 bbl/d and employed 224 Libyans.

Western Europe was the main outlet for Libya's petroleum exports. The Organization for Economic Cooperation and Development (OECD) reported that Libya's exports to Europe in 1988 averaged 1,069,000 bbl/d of which 1 million barrels was crude oil and the remainder was petroleum products consisting almost entirely of naphtha and fuel oils.

MOROCCO⁷

Phosphate mining and chemical fertilizer production were the predominant mineral industries of Morocco. Moroccan phosphate rock production increased by 17% in 1988. Production was stimulated by a partial recovery of world phosphate market prices and vigorous growth in local beneficiation of rock into higher value-added derivatives such as phosphoric acid and fertilizers. Phosphoric acid and fertilizer production capacity became 100% on-stream during the year.

Plans were announced for a doubling of this production capacity by 1992.

Apart from phosphate rock production, the remaining mineral activity in Morocco had mixed results, but, in general, performance was good in 1988. Nonphosphate mineral production and exports grew by 2% and 9%, respectively.

Government Policies and Programs

During the year, the Government was establishing plans for the future privatization of certain industrial operations. Speculation on the industrial operations that would be selected for privatization targeted the iron and steel industry, coal mining, and other joint-venture metal and industrial operators. Moroccan legislation required that these joint-venture operations were to be partly controlled by the Government's Bureau de Recherches et de Participations Minières (BRPM).

Ongoing conflict between the Moroccan Government and the Polisario guerrillas over the sovereignty of the Western Sahara continued in 1988, although dialogue directed at a settlement surfaced during the year.

Production and Trade

Phosphate rock production increased 17% over the previous year. Phosphate rock and finished fertilizer exports were 15.8 million tons, an increase of 9.5% over those of 1987. Higher international sales prices resulted in a 34% increase in export receipts. In particular, finished fertilizer sales alone increased 70% in volume and 84% in value. The total phosphate sector rock and fertilizer export revenues were estimated at about \$1.5 billion for 1988, and the projected increase in 1989 was estimated to be roughly \$2 billion. Major markets for Moroccan phosphate exports involved 36 countries including Spain, Belgium, Luxembourg, and Mexico as the principal clients.

Commercially, Morocco continued its strong ties to the European Community during the year. The exceptionally

strong growth of phosphate rock and derivative sales receipts for 1988 helped to decrease the Moroccan trade deficit to \$1.14 billion⁸ compared to \$1.4 billion for 1987. Continued low, world-market prices for grain and crude oil imports also helped during the year.

Morocco's energy import bill remained a problem in 1988. Crude oil imports to Morocco from Iraq, Kuwait, and other Middle Eastern countries amounted to \$525 million. Large oil shale reserves remained uneconomic due to lower world oil prices.

Total sales for steel in 1988 showed an increase of approximately 16% more than those of the previous year. Importation of steel bars was approximately 328,000 tons, an increase of nearly 20% more than in 1987. The Moroccan Ministry of Industry and Commerce reported that Moroccan export controls on ferrous scrap exports were lifted in January 1986. Since that time, Morocco freely exported between 88,000 and 110,000 tons per year.

Commodity Review

Metals.—The Bou Azzer cobalt mine reopened in 1987 after a 6-year closure. The Moroccan Compagnie de Tifnout Tiranimine (CTT) resumed mining in the Bou Azzer district, which was in the Anti-Atlas Mountains of central Morocco. Geologically, the cobalt ore was associated with copper-iron-nickel arsenides in altered igneous rocks of an ophiolite complex. Typically, cobalt mining worldwide was as a byproduct of either copper or nickel mining. However, Bou Azzer represented the only primary cobalt mine in the world and accounted for about 6% of world production during the 1970's and early 1980's.

The Douar Lahjar massive polymetallic sulfides exploration and development program in the Guesmassa area, south of Marrakech, continued during the year. The prospect was under the direction of Cie. Minière de Guesmassa, a joint venture of BRPM and Omnium Nord Afri-

TABLE 10
MOROCCO: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	1984	1985	1986	1987 ^p	1988 ^q
METALS					
Antimony concentrate:					
Gross weight	2,209	1,749	1,468	1,058	³ 555
Sb content	972	^q 750	617	444	³ 250
Cobalt concentrate:					
Gross weight	—	—	—	2,113	³ 2,384
Co content	—	—	—	224	³ 253
Copper:					
Concentrates, gross weight	65,470	61,804	58,707	46,251	³ 41,001
Matte, gross weight	1,361	2,481	1,349	2,441	³ 2,981
Cu content, concentrates and matte	22,093	21,625	20,165	16,541	³ 15,396
Iron and steel:					
Iron ore:					
Gross weight	162,984	190,528	195,600	210,200	³ 114,209
Fe content	101,050	118,000	123,228	128,100	69,668
Metal:					
Pig iron ^q	15,000	15,000	15,000	15,000	15,000
Steel, crude ^q	6,000	6,000	6,000	6,000	7,200
Lead:					
Concentrate:					
Gross weight	143,890	152,549	104,398	105,090	³ 100,221
Pb content	100,723	106,784	76,211	75,665	³ 72,159
Cupreous Matte, Pb content	218	645	351	635	³ 775
Metal:					
Smelter, primary only	46,100	59,500	60,000	62,500	³ 68,410
Refined:					
Primary	46,054	59,470	^q 60,000	62,497	³ 68,410
Secondary ^q	2,000	2,000	2,000	2,000	2,000
Total^q	48,054	61,470	62,000	64,497	70,410
Manganese ore, largely chemical-grade	56,786	43,690	40,334	42,500	30,100
Nickel, Ni content of cobalt ore ^q	—	—	—	—	—
Silver: Ag content of concentrates and matte	2,629	2,800	1,991	1,975	³ 61,847
Ag content of mine and smelter bullion	2,154	2,705	5,252	3,482	³ 75,426
Total do.	4,783	5,505	7,243	5,457	7,273
Zinc concentrate:					
Gross weight	20,247	27,153	24,344	19,874	³ 21,304
Zn content ^q	10,700	14,700	13,100	10,300	³ 10,865
INDUSTRIAL MINERALS					
Barite	561,321	500,000	189,881	143,503	³ 321,562
Cement, hydraulic	thousand tons	3,588	3,697	^q 3,700	3,800
					³ 4,220

See footnotes at end of table.

TABLE 10—Continued
MOROCCO: PRODUCTION OF MINERAL COMMODITIES¹
(Metric tons unless otherwise specified)

Commodity ²	1984	1985	1986	1987 ^p	1988 ^q
INDUSTRIAL MINERALS—Continued					
Clays, crude:					
Bentonite	1,825	2,877	3,834	2,948	³ 3,445
Fuller's earth (smectite)	33,406	24,425	35,100	46,271	³ 52,694
Montmorillonite (ghassoul)	3,382	4,656	4,313	4,981	³ 4,367
Feldspar ^r	1,000	1,000	1,000	1,000	1,000
Fluorspar, acid-grade	65,900	74,350	83,000	78,000	³ 100,500
Gypsum ^r	450,000	450,000	450,000	450,000	450,000
Mica	³ 1,200	1,440	^r 1,500	1,500	1,500
Mineral water	70,000	^r 70,000	^r 70,000	70,000	70,000
Phosphate rock (includes Western Sahara) thousand tons	21,245	20,737	21,178	21,300	³ 25,015
Salt, rock	62,740	92,263	96,514	107,838	³ 132,661
MINERAL FUELS AND RELATED MATERIALS					
Coal, anthracite thousand tons	838	774	^r 775	634	637
Gas, natural:					
Gross ^r million cubic feet	2,700	2,600	2,600	2,600	2,600
Marketed ^r do.	1,100	2,000	2,000	2,000	2,000
Petroleum:					
Crude ^r thousand 42-gallon barrels	270	260	260	260	260
Refinery products:					
Distillate fuel oil do.	9,500	9,500	9,500	9,500	9,500
Gasoline do.	3,300	3,300	3,300	3,300	3,300
Jet fuel do.	1,500	1,500	1,500	1,500	1,500
Kerosene do.	750	750	750	750	750
Other do.	2,100	2,100	2,100	2,100	2,100
Refinery fuel and losses do.	1,500	1,500	1,500	1,500	1,500
Residual fuel oil do.	13,000	13,000	13,000	13,000	13,000
Total do.	31,650	31,650	31,650	31,650	31,650

^r Estimated. ^p Preliminary. ^q Revised.

¹ Includes data available through June 1, 1987.

² In addition to the commodities listed, a variety of crude construction materials is produced, but available information is inadequate to make reliable estimates of output levels. Limestone quarried for cement manufacture is substantial; however, information is inadequate.

³ Reported figure.

⁴ Includes following types of concentrates: Copper (37,879 tons at 35% Cu); silver-copper (355 tons at 38.29% Cu, 2,107 grams per ton Ag); and gold-silver copper (2,767 tons at 9.9% Cu, 105.3 grams per ton Au, 770 grams per ton Ag) and gold-silver-copper (2,767 tons at 9.9% Cu, 105.3 grams per ton Au, 770 grams per ton Ag).

⁵ Cupreous matte containing 58% Cu, 26% Pb, 1,500 grams per ton Ag.

⁶ Contained in copper concentrates and matte identified in footnotes ⁴ and ⁵ and in lead concentrates (100,221 tons at 500 grams per ton Ag).

⁷ Contained in a presumably mine-produced bullion, (132 tons at 98.9% Ag) and lead smelter product (38.5 tons at 99.8% Ag).

cain. Omnium Nord Africain was related to the United Kingdom based Omnium Natural Resources, a subsidiary of the Swiss merchant Bank So-

ciété Financière Omnium (SFO). BRPM metal exploration activities during the year centered on the Ougnat area and in the Anti-Atlas and High

Atlas mountain ranges. Specifically, BRPM had targeted prospects of copper at Tizert, silver at Koudiat al-Hamra, and gold at Boumaadine.

Zones of mineralization in the central Moroccan lead area and the eastern Rif were also BRPM exploration targets in 1988.

Uranium extraction from phosphate rock remained too costly; however, exploration for significant uranium deposits continued.

Industrial Minerals.—Cement.—Moroccan cement production increased during the year by approximately 11% over the 1987 figure. Total cement production for 1988 was approximately 4.22 million tons. Modernization of the cement industry was to include installation of a flash dryer and a high-efficiency separator at the Société des Ciments d'Agadir's raw grinding plant.

Phosphate Fertilizers.—Phosphate rock occurred in four geologically related provinces in Morocco. These areas, in the following order, from north to south were: (1) the Khouribga Plateau, the largest and most mined area; (2) the Ganntour Plateau; (3) the unexploited Meskalas reserve; and (4) the Bou Craa reserve in the Western Sahara. These four provinces possessed 22 billion metric tons of phosphate rock or between one-half to three-quarters of the worldwide reserve base.

The Moroccan phosphate parastatal, Office Cherifien des Phosphates (OCP), controlled mining, beneficiation, and marketing of phosphate rock and fertilizers. Phosphate rock production increased to 25 million tons in 1988, 17% greater than the 1987 figure. Additionally, the exports of phosphate rock and derivative products for 1988 increased 9.5% to 15.8 million tons, rebounding after a 3-year sales low.

Production at the Bou Craa complex in the Western Sahara increased over 60% to 1.5 million tons. Bou Craa's rated production capacity was 2.2 million tons. Increased global phosphate rock sales were responsible for the increased production in Morocco. This was especially true of rock processed in domestic plants that produced finished

fertilizers and phosphoric acid for the export market. Local sales of phosphate rock rose by about one-third and was a reflection of increased emphasis on production of phosphoric acid and higher value-added downstream products. Morocco was capable of local production of phosphoric acid as well as the fertilizers monammonium phosphate (MAP), ammonium sulfur phosphate (ASP), diammonium phosphate (DAP), nitrogen-phosphorus-potassium (NPK), and triple superphosphate (TSP). Overall production of these downstream derivative products increased nearly 50% when the Jorf Lasfar phosphoric acid plant, south of Casablanca, was brought on-line after completion of production modifications and improvements by European contractors.

As part of the Government's National Plan for Economic and Social Development, OCP sanctioned prefeasibility work beginning in 1988 by several European contractors. The objective was to effectively double the processing capacity at Jorf Lasfar by 1992. The initial phase of the \$1.05 billion scheme called for construction of Maroc Phosphore 5 and 6. The initial phase involved the construction of a 100-megawatt powerplant, sulfuric-and phosphoric-acid production plants, and a production plant for TSP, MAP, and DAP. Following this initial phase, the construction of Maroc Phosphore 7 and 8 would begin. This large investment was expected to increase Morocco's share of the world phosphate and finished fertilizer market. Greater competition with the United States phosphate industry would also be augmented by the Moroccan phosphate construction investment.

Barite production more than doubled in 1988 to 321,562 tons. Export receipts for barite also doubled to \$16.6 million. In addition, fluorine production rose to 100,500 tons.

Mineral Fuels.—Coal.—Morocco's only coal mine was in the northeastern town of Jerada near the Algerian border.

The mine was operated by the Moroccan Government parastatal, Charbonnages du Maroc, and was scheduled to produce 1 million metric tons of coal in 1988. Production has stagnated, however, in the last several years due to managerial and technical problems, and anthracite coal production was approximately 637,000 metric tons. Technical problems were mainly centered on the difficulties inherent in mining a relatively thin (less than 1-foot) coal seam. Further complications occurred in late 1988 when union leaders called for a strike to protest unsafe working conditions and insufficient compensation for miners. A labor agreement did not materialize during the year, and, if conditions persist, the 1989 production at the Jerada coal mine could be less than that of 1988. This situation could result in increased reliance on imported coal for national needs. Independent of labor problems, Morocco's demand for imported coal increased substantially during the year. The situation was due primarily to a shift in national strategy away from fuel oil to coal for electrical generation and other industrial applications.

The National Electricity Office power station in Mohammedia had a requirement for 800,000 metric tons of coal during the year. Producers in the United States and Colombia made bids in past years for this contract, the largest in the Moroccan coal market. In December 1988, the United States exported 35,300 metric tons of steam coal to Morocco.

Natural Gas.—Total natural gas production for 1988 was estimated to be 2.6 billion cubic feet. Daily production was approximately 8 million cubic feet. Reserves of natural gas were estimated at between 70 and 100 billion cubic feet.

Discussion between Morocco and Algeria during the year centered on the revival of the plan to construct a natural gas pipeline from Algeria through Morocco and to supply Spain and Europe. Estimated costs for feasibility

studies, engineering, and construction of the pipeline were \$2.2 billion. This project could be of benefit to the Moroccan steel industry as a power source for steel manufacturing. In addition, preliminary discussions were held on a joint venture involving Morocco, Algeria, and the United States to liquify Algerian gas at a proposed Moroccan liquid natural gas plant.

Petroleum.—Ratification of the new hydrocarbon law during the year was delayed by the Moroccan Parliament. The law, as proposed, would diminish uncertainties regarding existing negotiating parameters for petroleum exploration concessions in Morocco. It would also have been considered to be an important development for many foreign oil companies. Passage of the law, however, could not guarantee increased interest in Moroccan exploration on the part of oil companies, but it would have been a positive signal in a highly competitive sector.

Activity increased during the year as the state oil company, Office Nationale de Recherches et d'Exploitation des Pétroles (ONAREP), planned 10 exploration wells and a doubling of seismic work. The 1988 exploration budget was funded at \$50 million. The necessary capital for exploration was to be supplied at a ratio of 40% by ONAREP and 60% by interested partners. Seven wells were drilled in 1987 at an average total depth of 7,127 feet. Production averaged 712 bbl/d in 1987 and probably did not exceed that amount in 1988.

Preliminary drilling of the first well offshore of Agadir took place in 1988. The Agadir prospect was selected following 2 years of evaluation of seismic data by Petro Canada International Assistance Corp. (PCIAC). Total depth for the well was planned at 10,827 feet, and the target reservoir was at 7,545 to 8,530 feet. Providing that the well was successful, Petro Canada could be offered a production-sharing agreement.

ONAREP underwent a massive reduction in the work force in June. Staff

reductions of up to 40% were realized by October 1988, and corporate restructuring would seem to be inevitable. Corporate restructuring could curtail inefficiency in the Moroccan petroleum sector, which centered on ONAREP's shortage of experienced exploration personnel and the lack of an organized seismic data analysis and retrieval system.

A new port for the unloading of petroleum and natural gas at Mohammedia went into operation in 1988. The new port was designed to accommodate Morocco's 1988 and future needs for the unloading of crude oil and natural gas. Design and construction of the port took place between 1980 and 1987. The port was capable of unloading a 110,000-ton tanker in less than 24 hours. The facility included a long seawall to protect the port and an offshore platform, which included two oil jetties. The first jetty was 56 feet deep and had five automation devices to unload crude oil at a rate of 176,678 cubic feet per hour. The second jetty was 61 feet deep and was also equipped with five automation devices to unload crude oil at rates between 212,000 and 353,357 cubic feet per hour.

TUNISIA⁹

Economic conditions moderated in Tunisia during 1988. Mineral production showed modest gains in most areas. Production of barite, fluorspar, iron ore, lead and zinc concentrates, and marine salt increased. Production of Tunisia's two principal mineral commodities, phosphate rock and crude petroleum, decreased. Mediocre performance in the domestic economy was offset by an increase in export trade receipts, from \$3.3 billion¹⁰ in 1987 to \$4.1 billion in 1988. Import totals rose from \$3.5 billion in 1987 to \$4.4 billion in 1988. Tunisia's trade deficit increased 50% to \$300 million due to higher commodity prices. The shrink-

age in the agricultural sector slowed the GDP growth to a marginal increase of 0.9%, to \$10 billion. The gross national product increased by \$696 million to \$10.3 billion.

Exhaustion of known deposits and antiquated equipment continued to be problems for the Tunisian mineral industry. The Government attempted to stimulate foreign investment in petroleum exploration and development. In 1988, Tunisia's energy sector was running out of easily developed resources. Government investment in the petroleum and natural gas sector totaled \$143 million in 1988. For 1989, Tunisia budgeted \$150 million for exploration and development in an attempt to curtail falling production levels. Based on 1988 figures, it was predicted that Tunisia could be a net energy importer by 1991-92.

Government Policies and Programs

The Tunisian effort to increase incentives for exploration was initiated with the 1985 hydrocarbons law. The legislation was amended in 1987 and was proposed for modification again in 1989. The 1987 changes had some positive effects in 1988. Foreign investors indicated that staff cost savings and the sliding scale introduced for governmental assessment of tax royalties have been welcome developments. The production-sharing provision of the hydrocarbons law led to the first production-sharing agreement on October 27, 1988, between Royal Dutch/Shell-Tunirex and the state oil company Enterprise Tunisienne d'Activités Pétrolières (ETAP). The agreement calls for the sharing of the 6,012-square-kilometer Metlaoui permit.

Proposed amendments to the hydrocarbon law could be expected in order to encourage further exploration in a market already perceived as favorable to international operators. The 1987 amendments involved consultations with the principal operators before legislation was enacted. Because no consultations had taken place in 1988 with firms already active in Tunisia, it is

expected that forthcoming amendments will be aimed at newcomers. Few details exist and these details depend upon further fiscal considerations.

The hydrocarbon legislation also sought to reduce the need for imports of Algerian natural gas. The French company Elf Aquitaine Tunisie (EAT) and the Italian firm Aziende Generali Italiana Petroli-Minière S.p.A. (AGIP) expressed interest in the natural gas arena. British Gas Corp. took over the 1,984-square-kilometer Miskar Gasfield from the U.S. firm, Tenneco. The United Kingdom utility firm estimated that it would cost \$500 to \$600 million to develop the field depending on the quality of the gas and the necessary infrastructure development. This could become the company's first international development as an operator. The Government officials were hopeful that the operations of British Gas will stimulate further international investment in the Tunisian energy sector.

In June 1988, the Government created the Ministry of Industry and Commerce and the Ministry of Energy and Mines to perform duties formerly handled by the Ministry of National Economy.

Production and Trade

Output of the key industrial minerals of Tunisia, crude oil and phosphate rock, decreased slightly in 1988 for the second consecutive year. Crude oil production decreased approximately 2%. Total hydrocarbon production, including petroleum, natural gas liquids, and refined petroleum products, fell to below 38,445,000 barrels. This resulted in a 2% shrinkage of the petroleum sector's contribution to the GDP. A slight increase in world phosphate prices helped the phosphate industry show a 1% growth in value. Production of phosphate rock was down nearly 5%. Total phosphate rock production by the state-operated Cie des Phosphates de Gafsa (CPG) was 6.1 million tons, approximately 25% of which was exported. The main export markets for Tunisian phosphate were Belgium,

France, Indonesia, and Turkey.

Tunisia's largest phosphate-based fertilizer production company was Société Industrielle d'Acide Phosphorique et d'Engrais (SIAPE). France and Italy were SIAPE's biggest triple superphosphate (TSP) customers. China, the U.S.S.R., and the United States were the principal purchasers of superphosphoric acid. SIAPE has licensed its phosphate production process for utilization in Bulgaria, Greece, Romania, and Turkey. The company was planning to build a plant in China and was bidding on one planned in Algeria. SIAPE was an equity and a technical partner in the Chinese plant.

Small-scale mining involved the production of lead, zinc, fluorite, and barite from Fej Lehdoum, a state-owned operation mining an ore grading an average 4.7% to 10.8% total lead and zinc; Zreiba-Jdidi mines, owned by Fluobar Co. of which the Arab Mining Co. (ARMICO) was a major shareholder; and Bou Jaber, a state-owned operation producing ore grading 34.7% barite, 3.9% zinc, 1.1% lead, and 9.8% fluorite.

Stronger relations were established between Tunisia and its North African neighbors in 1988. The Maghreb Arab Union fostered economic cooperation between the member nations of Algeria, Libya, Mauritania, Morocco, and Tunisia. Trade between Tunisia and the other member nations of the UMA was previously very limited.

Commodity Review

Metals.—Iron and Steel.—Tunisian iron and steel production fell nearly 4% due to a probable relining of the blast furnace with refractory bricks at the nation's only integrated steel plant, El Fouladh at Menzel Bourguiba. This maintenance process occurs every 5 years.

Industrial Minerals.—Cement.—Cement production increased slightly in 1988. Exports of cement rose for the

fourth consecutive year. Tunisia's mill capacity for cement was 5 million metric tons. Clinker capacity was 4.8 million metric tons. Société Tuniso-Algérienne de Ciment Blanc commenced startup in 1987 of its 210,000-metric-ton-per-year white cement plant in Feriana, Tunisia. This joint venture between Algeria and Tunisia was the first plant of its kind in Africa and the third largest in the world. The white cement produced was distributed equally between both countries. Tunisia's coastal cement plants were geographically well placed to take advantage of the tourism construction boom on both shores of the Mediterranean.

Fertilizer Materials.—Domestic companies consumed 75% of the phosphate rock produced in Tunisia and processed it into phosphate products such as triple superphosphate (TSP), monoammonium phosphate (MAP), diammonium phosphate (DAP), and dicalcium phosphate (DCP). Eighty percent of the resultant higher value-added products were exported along with 25% of phosphate rock output. The industry hopes eventually to have the capacity to sell all of the phosphate rock to domestic processors. Fertilizer material production figures for the year were as follows, in metric tons: TSP at 921,377 metric tons; MAP at 59,983 metric tons; DAP at 544,586 metric tons; and DCP at 45,456 metric tons.

SIAPE owns two sites in Sfax and a new facility in La Skhirra. SIAPE and Industries Chimiques de Gafsa (ICG) were processing 75% of Tunisia's phosphate rock output. SIAPE experienced a closure in mid-November 1988 of its 335,000 metric tons per year TSP factory A in Sfax. The facility was closed because of community protests against serious pollution problems precipitated by sulfur dioxide emissions and phosphogypsum waste. The plant was scheduled to reopen in March 1989 after the installation of pollution control equipment. Additionally, the obsolete sulfuric acid unit at factory A in Sfax had been closed permanently

TABLE 11
TUNISIA: PRODUCTION OF MINERAL COMMODITIES¹
(Metric tons unless otherwise specified)

Commodity ²		1984	1985	1986	1987	1988 ³
Metals						
Iron and steel:						
Iron ore and concentrate, gross weight	thousand tons	308	306	311	³ 295	³ 325
Metal:						
Pig iron	do.	150	⁴ 150	150	150	150
Steel, crude	do.	169	170	181	180	180
Lead:						
Mine output, Pb content		4,056	2,484	1,930	³ 3,465	³ 3,653
Metal:						
Primary ⁴		8,400	2,040	2,208	2,200	³ 2,200
Secondary ⁴		500	500	500	500	500
Total⁴		8,900	2,540	2,708	2,700	2,700
Silver metal, primary	thousand troy ounces	85	26	50	50	50
Zinc, mine output, Zn content		6,660	5,580	4,488	4,500	³ 8,500
INDUSTRIAL METALS						
Barite		12,100	20,000	15,718	¹ 14,412	³ 18,868
Cement, hydraulic	thousand tons	2,777	3,070	2,984	3,400	3,228
Clays, construction ⁴	do.	350	350	350	350	350
Flourspar, chemical- and metallurgical-grades		44,510	42,240	36,828	43,298	³ 55,416
Gypsum ⁴		85,000	90,000	100,000	100,000	100,000
Lime	thousand tons	600	⁴ 600	650	650	650
Phosphate rock, gross weight	do.	5,346	4,530	5,951	³ 6,390	³ 6,103
Salt, marine	do.	330	382	415	³ 425	³ 485
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross ⁴	million cubic feet	¹ 18,000	¹ 16,400	¹ 15,400	¹ 13,800	13,000
Marketed	do.	⁴ 9,000	⁴ 8,200	⁴ 7,700	⁴ 6,900	6,500
Petroleum:						
Crude	thousand 42-gallon barrels	¹ 43,800	¹ 42,916	¹ 39,055	37,960	³ 37,230
Refinery products:						
Gasoline	do.	1,794	⁴ 1,800	¹ 1,825	1,800	1,800
Kerosene	do.	2,402	⁴ 2,400	¹ 1,095	2,400	2,400
Distillate fuel oil	do.	3,156	⁴ 3,000	¹ 3,650	3,000	3,000
Other	do.	394	⁴ 400	¹ 730	400	400
Refinery fuel and losses	do.	160	⁴ 200	¹ 1,095	200	200
Residual fuel oil	do.	3,936	⁴ 4,000	¹ 4,380	4,000	4,000
Total	do.	11,842	⁴11,800	¹12,775	11,800	11,800

⁴ Estimated. ² Preliminary.

¹ Table includes data available through June 9, 1988.

² In addition to the commodities listed, a variety of crude construction materials (common clays, sand and gravel, and stone) is produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels. Limestone quarried for cement manufacture is substantial; however information is inadequate to make accurate estimates of output.

³ Reported figure.

⁴ From domestic and imported ores.

TABLE 12
TUNISIA: EXPORTS OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	1986	1987	United States	Destinations, 1987
				Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	46	—		
Metal including alloys:				
Scrap	559	1,103	—	Italy 346; France 223; Belgium-Luxembourg 178.
Unwrought	—	487	—	Italy 279; Belgium-Luxembourg 208.
Semimanufactures	1,641	754	—	Algeria 716; France 30.
Copper: Metal including alloys:				
Scrap	1,051	2,088	—	Spain 600; Switzerland 374; France 240.
Semimanufactures	—	20	—	Morocco 18; France 2.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	3,025	2,933	—	All to France.
Metal:				
Scrap	1,457	243	—	France 90; Belgium-Luxembourg 84; Netherlands 68.
Steel, primary forms	765	3,008	—	Pakistan 2,004; Turkey 1,004.
Semimanufactures:				
Bars, rods, angles, shapes, sections	57	62	—	Burkina Faso 60.
Universals, plates, sheets	(²)	1,136	—	All to United Kingdom.
Hoop and strip	10	36	—	All to France.
Wire	499	2,744	—	Algeria 2,599; Martinique 80.
Tubes, pipes, fittings	(³)	11,143	—	Algeria 10,660; Switzerland 359.
Lead:				
Ore and concentrate	3,000	2,000	—	All to Italy.
Oxides	335	—		
Metal including alloys:				
Scrap	588	1,592	—	Italy 914; Belgium-Luxembourg 436.
Unwrought	—	60	—	All to France.
Magnesium: Metal including alloys, scrap				
	14	—		
Zinc:				
Ore and concentrate	(⁴)	15,256	—	France 7,231; Belgium-Luxembourg 6,175.
Metal including alloys, scrap	20	24	—	All to Italy.
Zirconium: Metal including alloys, scrap				
	—	24	—	Do.
Other: Ores and concentrates				
	—	11,000	—	Do.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones				
	5	15	NA	NA.
Barite and witherite				
	—	4,822	—	Angola 3,801; Gabon 1,001.
Cement	value, thousands	\$10,408	\$24,986	—
				Spain \$13,565; Cameroon \$5,715.
Diamond: Gem, not set or strung				
	do.	\$6,738	\$8,462	—
				All to Belgium-Luxembourg.

See footnotes at end of table.

TABLE 12—Continued
TUNISIA: EXPORTS OF MINERAL COMMODITIES¹
(Metric tons unless otherwise specified)

Commodity	1986	1987	Destinations, 1987	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Feldspar, fluorspar, related materials	6,100	8,536	—	Italy 8,486.
Fertilizer materials: Manufactured:				
Nitrogenous	32,988	71,750	—	France 70,256.
Phosphatic	1,335,683	1,614,178	47,500	Italy 259,703; U.S.S.R. 199,855; France 197,461.
Lime	—	4	—	All to Togo.
Phosphates, crude thousand tons	1,206	1,241	—	Romania 232; Greece 200; France 184.
Salt and brine	359,568	340,702	26,000	Italy 155,234; Denmark 55,031.
Stone, sand and gravel:				
Dimension stone, worked	(⁵)	65	—	Saudi Arabia 26; Algeria 21; Senegal 18.
Quartz and quartzite	1	1	—	All to Italy.
Sand other than metal-bearing	15	5	—	France 2; Italy 2.
Other:				
Crude value, thousands	—	\$2	NA	NA.
Slag and dross, not metal-bearing	1,024	2,000	—	All to Italy.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum:				
Crude thousand 42-gallon barrels	28,714	26,038	586	Italy 10,277; West Germany 7,273.
Refinery products:				
Liquefied petroleum gas do.	—	194	—	Italy 176; France 18.
Gasoline, motor do.	519	808	—	France 190; Greece 162; United Kingdom 141.
Kerosene and jet fuel do.	35	—	—	
Distillate fuel oil do.	(⁶)	—	—	
Lubricants do.	(⁵)	(⁵)	—	All to Algeria.
Residual fuel oil do.	1,488	1,786	—	France 1,487; Yugoslavia 166.
Bituminous mixtures do.	18	—	—	

NA Not available.

¹ Table prepared by Virginia A. Woodson.

² Unreported quantity valued at \$4,046,000.

³ Unreported quantity valued at \$15,106,000.

⁴ Unreported quantity valued at \$713,000.

⁵ Less than 1/2 unit.

⁶ Residual fuel was inadvertently reported as distillate fuel oil in the last edition of this table.

TABLE 13
TUNISIA: IMPORTS OF MINERAL COMMODITIES¹
(Metric tons unless otherwise specified)

Commodity	1986	1987	Sources, 1987	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	—	1	(²)	Mainly from France.
Aluminum:				
Ore and concentrate	—	508	(²)	Italy 458; Spain 50.
Oxides and hydroxides	26,859	21,285	(²)	Italy 16,765; France 4,472.
Metal including alloys:				
Unwrought	1 956	937	—	Netherlands 497; Canada 350.
Semimanufactures	2,640	3,608	2	Italy 1,192; Egypt 586; France 572.
Chromium: Oxides and hydroxides	27	36	—	West Germany 16; France 13.
Cobalt: Oxides and hydroxides value, thousands	\$10	\$1	—	All from Italy.
Copper:				
Matte and speiss including cement copper	96	96	—	Italy 76; France 20.
Metal including alloys:				
Scrap	2	—		
Unwrought	316	601	—	Italy 428; United Kingdom 100.
Semimanufactures	7,438	7,493	—	France 4,472; Belgium-Luxembourg 1,723.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	70,689	63,066	—	All from Morocco.
Metal:				
Scrap	537	1,753	400	Algeria 1,196; France 156.
Pig iron, cast iron, related materials	1,422	1,501	—	Turkey 750; Brazil 500; Canada 125.
Ferroalloys:				
Ferromanganese	370	32	—	All from France.
Unspecified	1,364	840	—	Yugoslavia 739; Norway 60.
Steel, primary forms	38,382	39,388	—	Spain 39,354.
Semimanufactures:				
Bars, rods, angles, shapes, sections	104,072	88,380	—	Spain 40,014; Romania 17,753; Portugal 9,039.
Universals, plates, sheets	110,625	102,595	(²)	France 25,267; Italy 21,123; West Germany 17,283.
Hoop and strip	3,544	3,221	—	France 1,462; Italy 1,029; Spain 49.
Rails and accessories	243	4,535	—	Republic of Korea 4,202; France 188.
Wire	2,576	2,257	(²)	France 1,121; Italy 529.
Tubes, pipes, fittings	17,912	15,000	836	West Germany 5,075; Italy 2,390; France 1,802.
Castings and forgings, rough	59	178	—	France 89; Spain 88.
Lead:				
Oxides	115	201	—	France 86; Spain 45; Italy 22.
Metal including alloys:				
Scrap	—	3	—	All from France.
Unwrought	2,709	3,038	—	Morocco 2,292; Belgium- Luxembourg 497.
Semimanufactures	9	23	—	France 22.

See footnotes at end of table.

TABLE 13—Continued
TUNISIA: IMPORTS OF MINERAL COMMODITIES¹
(Metric tons unless otherwise specified)

Commodity	1986	1987	Sources, 1987	
			United States	Other (principal)
METALS—Continued				
Magnesium: Metal including alloys, semimanufactures value, thousands	\$9	\$5	—	All from France.
Manganese:				
Ore and concentrate, metallurgical-grade	155	181	—	Gabon 180.
Oxides	103	77	—	France 25; West Germany 24; Belgium-Luxembourg 21.
Mercury 76-pound flasks	319	319	—	Mainly from Nigeria.
Molybdenum: Metal including alloys, all forms value, thousands	\$18	\$20	—	Netherlands \$8; Austria \$6; Switzerland \$3.
Nickel:				
Matte and speiss do.	\$2	\$10	—	Brazil \$3; France \$3; United Kingdom \$3.
Metal including alloys, semimanufactures	90	70	—	France 19; Norway 17; Austria 11.
Platinum-group metals: Metal including alloys, unwrought and partly wrought value, thousands	\$30	\$1	—	All from France.
Silver: Metal including alloys, unwrought and partly wrought do.	\$70	\$50	—	France \$23; Italy \$18.
Tin:				
Metal including alloys:				
Scrap	—	1	—	All from France.
Unwrought	36	39	—	Indonesia 16; Malaysia 15.
Semimanufactures	19	27	—	West Germany 11; France 8.
Titanium: Oxides	307	339	55	West Germany 116; France 82.
Tungsten: Metal including alloys, all forms value, thousands	\$23	\$45	—	France \$25; Netherlands \$19.
Zinc:				
Oxides	375	223	—	France 123; Italy 49; West Germany 26.
Metal including alloys:				
Unwrought	2,271	1,168	—	Belgium-Luxembourg 567; Italy 204; Spain 200.
Semimanufactures	334	279	—	Spain 175; France 72.
Other:				
Ores and concentrates	60	47	—	Italy 44; Spain 3.
Oxides and hydroxides	131	162	39	West Germany 70; France 24.
Base metals including alloys, all forms	—	35	(²)	China 32.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	708	2,618	—	Turkey 1,845; Italy 241; Iceland 232.
Artificial: Corundum	183	153	—	France 108; Italy 37.
Dust and powder of precious and semiprecious stones including diamond value, thousands	\$43	\$11	—	All from Belgium-Luxembourg.

See footnotes at end of table.

TABLE 13—Continued
TUNISIA: IMPORTS OF MINERAL COMMODITIES¹
(Metric tons unless otherwise specified)

Commodity	1986	1987	Sources, 1987	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Abrasives, n.e.s.—Continued				
Grinding and polishing wheels and stones	177	227	(²)	Italy 106; Spain 57; France 23.
Asbestos, crude	9,207	7,057	—	Zimbabwe 4,251; Canada 1,939.
Barite and witherite	90	20	—	All from France.
Boron materials:				
Crude natural borates	—	1	—	Mainly from Turkey.
Oxides and acids	48	33	—	Italy 20; France 6.
Cement	60,272	60,064	—	France 52,464; Italy 4,650.
Chalk	2,354	1,847	—	France 1,497; Italy 350.
Clays, crude	34,932	58,663	12	Spain 18,373; Morocco 16,395; Italy 7,242
Diamond: Gem, not set or strung value, thousands	\$11,255	\$12,024	—	Belgium-Luxembourg \$9,984; Tanzania \$1,397.
Diatomite and other infusorial earth	167	436	—	Algeria 380; France 35.
Feldspar, fluorspar, related materials	8,190	4,302	—	Spain 2,840; France 935.
Fertilizer materials: Manufactured:				
Ammonia	203,801	273,651	102,750	Kuwait 65,233; Bahrain 53,846.
Nitrogenous	8,169	12,514	—	Italy 8,504; Belgium-Luxembourg 3,055.
Phosphatic	150	—	—	—
Potassic	15,021	3,501	—	Italy 3,001; Belgium-Luxembourg 500.
Unspecified and mixed	75	13	—	West Germany 12; Spain 1.
Graphite, natural	1	11	—	All from France.
Gypsum and plaster	519	478	—	Do.
Lime	131	14	—	Do.
Magnesium compounds, unspecified	480	698	—	Greece 492; Netherlands 148.
Mica:				
Crude including splittings and waste	13	8	—	All from France.
Worked including agglomerated splittings value, thousands	\$9	\$7	—	France \$4; Italy \$1.
Phosphates, crude do.	\$1	\$1	—	All from France.
Pigments, mineral: Iron oxides and hydroxides, processed	168	280	—	West Germany 191; Spain 14; Italy 30.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	\$5	\$6	\$6	—
Synthetic do.	—	\$17	—	All from France.
Pyrite, unroasted	10	5	—	All from Italy.
Salt and brine	71	77	—	West Germany 60; Ireland 11.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	6,299	4,722	—	Italy 2,626; Bulgaria 1,000; France 557.
Sulfate, manufactured	33,496	50,121	—	Spain 26,222; France 11,407; Romania 5,000.

See footnotes at end of table.

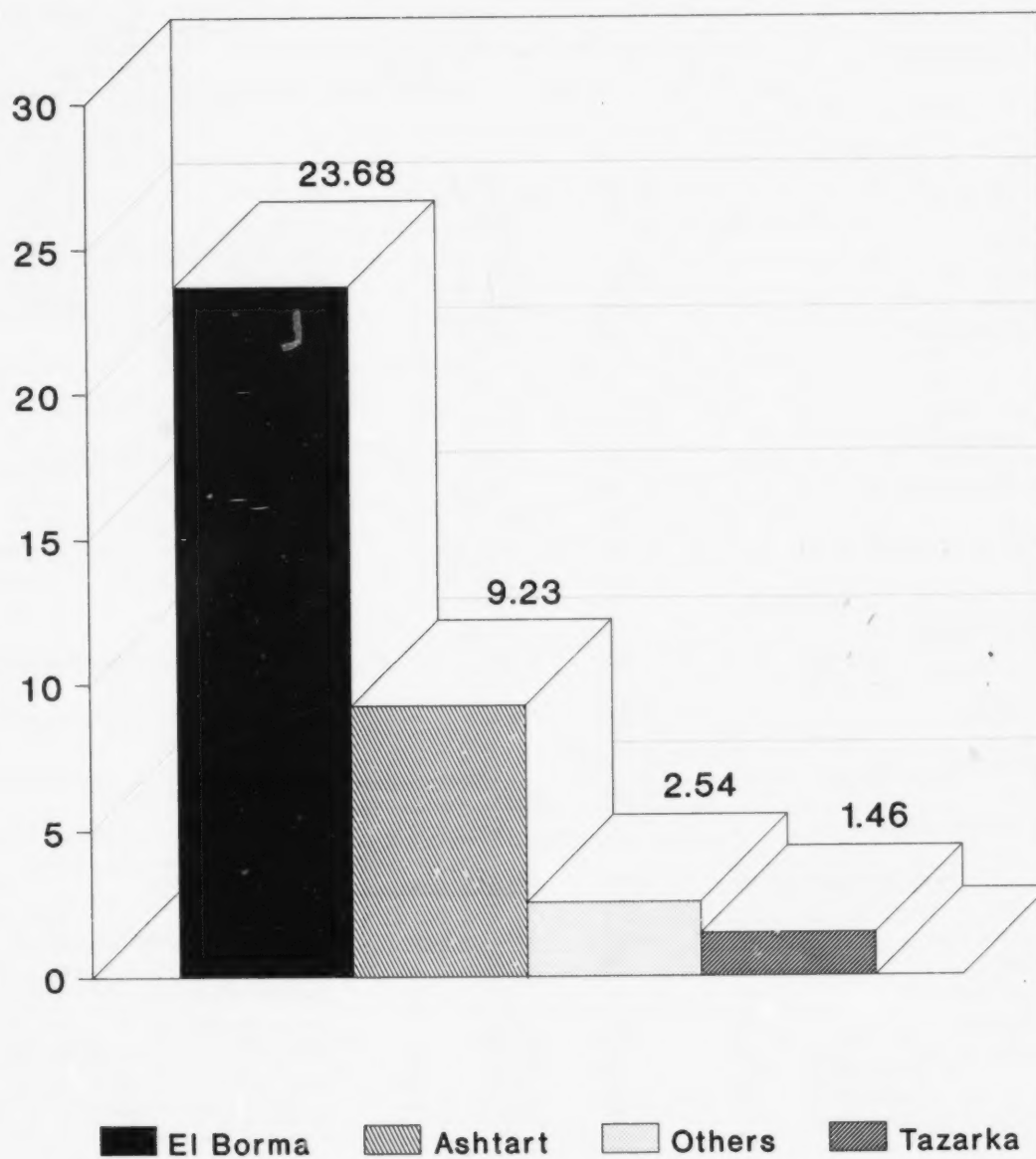
TABLE 13—Continued
TUNISIA: IMPORTS OF MINERAL COMMODITIES¹
(Metric tons unless otherwise specified)

Commodity	1986	1987	Sources, 1987	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	19,080	14,531	—	Italy 14,286.
Worked value, thousands	\$132	\$2	—	All from Morocco.
Dolomite, chiefly refractory-grade	509	125	—	Spain 100; West Germany 25.
Gravel and crushed rock	47,372	14,512	—	Italy 14,426.
Quartz and quartzite	925	1,336	—	Belgium-Luxembourg 1,261; Italy 55.
Sand other than metal-bearing	1,104	1,542	—	Belgium-Luxembourg 1,000; West Germany 516.
Sulfur:				
Elemental:				
Crude including native and byproduct thousand tons	1,096	1,120	94	Canada 443; Poland 202; Kuwait 96.
Colloidal, precipitated, sublimed	48	73	—	West Germany 50; France 14.
Sulfuric acid	46	4,224	9	Italy 4,181.
Talc, steatite, soapstone, pyrophyllite	1,044	1,191	—	France 823; Italy 207; Belgium-Luxembourg 125.
Other: Crude	9	11	—	West Germany 4; Italy 4.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	7	13	2	France 11.
Carbon black	1,595	1,917	—	Italy 1,403; France 182; West Germany 151.
Coal:				
Anthracite and bituminous	12,258	11,951	—	France 5,250; Morocco 3,553; Belgium-Luxembourg 3,148.
Lignite including briquets	4	—	—	—
Coke and semicoke	81,153	92,164	—	Algeria 48,992; Italy 38,272.
Peat including briquets and litter	1	2	—	All from France.
Petroleum:				
Crude thousand 42-gallon barrels	2,973	2,974	—	All from Saudi Arabia.
Refinery products:				
Liquefied petroleum gas do.	5,901	2,930	—	Algeria 1,614; Italy 568; Spain 169.
Gasoline, motor do.	(²)	(²)	—	Mainly from Belgium-Luxembourg.
Mineral jelly and wax do.	7	12	(²)	West Germany 6; France 4.
Kerosene and jet fuel do.	702	1,074	—	Greece 750; Italy 324.
Distillate fuel oil do.	—	3,868	—	Greece 2,038; Italy 1,090; Bulgaria 347.
Lubricants do.	25	209	(²)	Saudi Arabia 152; Italy 28.
Residual fuel oil do.	5,402	2,956	(²)	Italy 882; France 737; Spain 754.
Bitumen and other residues do.	—	225	—	Turkey 135; Spain 89.
Bituminous mixtures do.	—	2	—	France 1; Spain 1.

¹ Table prepared by Virginia A. Woodson.

² Less than 1/2 unit.

FIGURE 2
TUNISIA—1988 CRUDE OIL PRODUCTION
(By field in million barrels per year)



because of environmental pollution. The future of the phosphoric acid unit was still being debated. The current acid requirements for the TSP plant were being supplied from SIAPE's La Skhirra site.

The operating capacity of the TSP unit was to be determined by prevailing market conditions. Full production of the TSP unit requires approximately 80,000 metric tons per year of P_2O_5 of acid. Factory B, also in Sfax, produced 200,000 metric tons per year of TSP. The plant was closed for 3 weeks during February and March 1988 for annual maintenance and cleaning. SIAPE's newest operation, SIAPE II, 80 kilometers south of Sfax, opened in 1988. SIAPE II was designed to produce 330,000 metric tons per year of superphosphoric acid. SIAPE also owns a bag production facility in Sidi Bouzid. Additionally, SIAPE's factory A and a bagging operation were on SIAPE's own quay in Sfax where both phosphate rock and fertilizer were stored and transferred directly to departing ships.

ICG, in Gafsa, was originally expected to produce 400,000 metric tons per year. Actual production figures were approximately 135,000 metric tons, according to SIAPE.

CPG called for submission of bids in April 1988 from U.S. companies to build an integrated phosphate treatment and handling facility for the phosphate deposit at Kef Eddour in southern Tunisia. Yearly production capacity at the site was expected to be 1.4 million metric tons of phosphate rock. The facility was to consist of two identical mechanical washing and treatment units utilizing screening and crushing, a storage area for the screened rock that was to be loaded on

railroad cars and transported to processing plants in Gabes and Sfax, a homogenization unit, and an electrical equipment supply and installation unit.

Mineral Fuels.—Petroleum.—At year-end, planned expansion to double the capacity of the Bizerte petroleum refinery awaited submission of bids from interested contractors. The expansion plan was one of several projects shelved in the early 1980's due to the economic crisis and the resultant cuts in capital investment. The plant produced an estimated average 30,000 bbl/d of refined petroleum products in 1988.

Bids also were to be submitted for a contract to develop the Ezzaouia oilfield in Tunisia. The 2,820-square-kilometer Zarzis permit contains the Ezzaouia oilfield, which was operated during the year by the U.S. company Marathon Petroleum Tunisia in partnership with ETAP, which owned 55% of the permit with Oranje-Nassau of the Netherlands and Elf Aquitaine Tunisie of France. The decision to develop this onshore field was a positive note in an otherwise depressed oil industry. Development was planned despite the fact that production was not expected to exceed 10,000 bbl/d. Reserves were being depleted and there was little hope of a major petroleum find.

The Italian firm AGIP Africa Ltd. began exploratory drilling in the El-Borma area to a depth of 4,000 meters. Production at the El-Borma Field was 65,000 bbl/d. Most of the natural gas produced in Tunisia was coming from the El-Borma Field. Preliminary geological surveys indicate deep oil reserves in structures similar to those found in Algeria and Libya. In May, the Government of Tunisia and the Government of Libya agreed to undertake a joint off-

shore hydrocarbon exploration project. In August, Tunisia accepted a 1982 International Court of Justice ruling that divided the Continental Shelf. Both countries were to operate jointly the 3,000-square-kilometer area 125 kilometers northwest of Libya's El Bouri offshore oil platform. Most of the area to be explored for oil was in the Libyan zone. Algeria, Libya, and Tunisia agreed to construct a natural gas pipeline. The March agreement specified a 400-kilometer pipeline from Algeria through Tunisia to Libya that would carry an estimated 3.6 billion cubic meters of gas per year at a construction cost of \$400 million. The proposed pipeline would fuel a petrochemical and aluminum complex in Libya and provide revenue to Tunisia in the form of gas royalties.

¹ Prepared by Bernadette Michalski, mineral specialist, Division of International Minerals.

² Where necessary, values have been converted from Algerian dinars (DA) to U.S. dollars at the rate of AD4.8497 = US\$1.00 in 1987 and AD5.9148 = US\$1.00 in 1988.

³ Prepared by Thomas P. Dolley, physical scientist, Division of International Minerals.

⁴ Where necessary, values have been converted from Egyptian pounds (LE) to U.S. dollars at the rate of LE2.21 = US\$1.00.

⁵ Prepared by Thomas P. Dolley, physical scientist, Division of International Minerals.

⁶ Where necessary, values have been converted from Libyan dinars (LD) to U.S. dollars at a rate of LD0.31594 = US\$1.00.

⁷ Thomas P. Dolley, physical scientist, Division of International Minerals.

⁸ Where necessary, values have been converted from Moroccan dirhams (DH) to U.S. dollars at the rate of Dh8.21 = US\$1.00.

⁹ Thomas P. Dolley, physical scientist, Division of International Minerals.

¹⁰ Where necessary, values have been converted from Tunisian dinars (D) to U.S. dollars at the rate of D0.83 = US\$1.00.